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SUMMARY.

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ADVERTISEMENT.

Our object, like that of people with more ostentatious charity, runs more ways than one, and were we rigidly cross-examined, it would be quite possible to discover that the principal of them lay in the direction of some little service to ourselves. Whether "self-love and social" be always the same thing or not, as the Essayist on Man asserts, we think it very comfortable when they are so, and are compelled to own to ourselves, if not to others, that we never feel better satisfied in playing the magnanimous than when inflated with the conviction that we are thereby adding to our credit account with happiness. Selfishness has many degrees, and the most sordid of men may be he to whom the trifles of the world offer the largest field for the display of generosity. He spends to save; like a seedsower in spring, he flings away in the service of gain; he is lavish in the cause of avarice; his virtues are to him a commodity, a stock-in-trade; he sacrifices himself to himself; his self-immolation is a self-deification. And thus, to speak frankly with the most selfish of objects, we gladly avail ourselves of the most generous of means. Like Henry the Fifth, we exclaim,

> By Jove, I am not covetous of gold, &c.
> But if it be a sin to covet honours,
> I am the most offending soul alive.

Because, like that truly cunning conqueror, we know that with honour gained, neither gold nor garments can be long wanting. In fact, we would make it worth the world's while to oblige us. We would serve them into being our servants.

And now to give that application, which some fastidious reader imagines he cannot see. This present Pharmaceutical Number is but one point in a large plan of ours, to make the whole Medical community largely our debtors in reference to the highest and perhaps the most important, matter in their professional existence. It has been our design to have the wide domain of the world's scientific literature presented under conditions so easy, that it may be open to every member of the body; to make the "Press"—the great engine of improvement, of civilization, and of comfort—exist not for overfeeding to madness in squares, the former tenants of unpaid-for garrets, but for enlightening, illustrating, and enriching a profession, which, worthy by its studies of all the tributes of wealth and power the Press can lay at its feet, still more requires them in its momentous relation with the well-being of society.

The readers of the *Medical Times* know that the plan has been far from inoperative: we have already effected much. When our Journal first came into the present hands, the weekly prints that circulated amongst the profession, gave hedomadally less information (counting word for word, line by line) than would fill a sixth of the pages the reader has before him; and while the modicum so furnished was little else than an empirical publication of worthless matter, to puff into notoriety some greedy hireling, otherwise unpaid, the price (double that paid for the present copy) was so much regulated in the inverse ratio of merit, as to place it beyond the means of many an inquiring and studious practitioner.

We *have* changed all this in the *Medical*; we make now an essay to change it in the *Pharmaceutical* world.

We wish to disparage none of the merits of the Journals devoted to Chemistry and Pharmacy, which the profession is happy enough already to possess. They occasionally publish excellent papers:—are conducted probably with the average ability shewn in scientific periodicals; and, doubtless, effect no little service to the progress of science. But they are clearly and palpably unequal to the greatness of their mission. If anywhere the progress of Chemistry and Science should be stimulated, it is in England, and *they* want the reqoisite energy. If, at any time, no fact or discovery throughout the whole scientific world should be lost—it is now: and *they* want the requisite space: if ever or anywhere, the uprising population should not be cut off from Chemical and Pharmaceutical Studies by an expensiveness above reach, it is in England at the present moment, and *they* want the requisite cheapness. We hope to accomplish an alteration in all this, and accordingly we publish for Fivepence, an amount of useful and valuable matter sufficient to fill three or four of the Journals which are customarily sold for a Shilling.

If we advance this as a service to science we shall probably get excuse.

One closing word on the papers we this day give: The "Annuare de Therrapeutique" is a work of European reputation and will be of rare value to those who have depended for their knowledge of scientific progress to any journal but the *Medical Times*. We shall continue it in our next Pharmaceutic number. Dr. Muspratt's original investigations on the Sulphates, is a paper of immense value. The well-directed labour that produced it must have been enormous, and Professor Liebig has shown his opinion of its excellencies by securing its translation by Dr. Hoffman for the next number of the Professor's "Annalen." Of the other papers it will be sufficient to say that they include every fact of value which the chemist and phamaceutist would find in wading through the many English and Foreign Journals devoted to his science, and of who, we would say, that we trust that they will be the source of as much profit to others, as they have been of labour and solicitude to us.

ANNUAIRE DE THERAPEUTIQUE

For 1844.

Translated from the French of Dr. A. Bouchardat, Assistant Professor of the Faculty of Medicine at Paris, Principal Pharmacien at the Hôtel-Dieu, &c.

Narcotics.—Opiates.—Opium is so valuable a medicine that practitioners are constantly seeking to vary the manner of its administration, to multiply the indications according to which it may be of service,—before entering upon which it may be advantageous to point out the physiological and therapeutic properties of the principal substances which enter into the composition of opium. *Morphine* ought certainly to be placed in the first range among the active principles of opium : its physiological action is nearly, but not absolutely, identical with that of opium. The nervous system of animals, in the highest order of the scale, is affected by the salts of morphia, as by the pharmaceutic preparations of opium, but the similarity of action is not observed lower in the scale. In fact, not to go lower than fishes, we find that opium acts on them with three or four times more energy than do the salts of morphia. This difference of action is not attributable to the narcotine, for that base, unless adulterated, is quite innocuous. *Codeine* represents the properties of morphia, exactly as brucine presents those of strychnia, and as cinchonine presents those of quinine. It acts precisely in the same manner as morphia does, but the doses must be at least five times as large. It is consequently useful in those cases for which small doses of morphia are of service, in certain gastralgias, and in spasmodic affections of the respiratory apparatus. If morphia, codeine, and narcotine, do not exhibit all the properties of opium, they must be sought for in the other principles which have been discovered in it, such as *thebaine, meconine, resin of opium*, or perhaps some other principles, which remain yet to be discovered. This active principle, which is neither morphia, nor codeine, nor narcotine, must be either very energetic, or else be contained in opium in very large quantity, as this product acts with considerable power on the lower orders of beings. The action of this substance is not manifested specifically on the central nervous system, but upon the entire living economy. This or these matters must have great analogy with the acrid alcalies obtained from the species *chelidonium* and *glaucium*. In this respect the genus *papaver* will have a certain resemblance with the other gencra, which, with it, constitute the family *papaveraceæ*.

The Opium of Algiers (extracted from M. Payen's report).—Mr. Hardy sent to the Academy 50 grammes of opium, obtained from 990 poppy-heads, by incisions made in the capsules. It presents all the characters of the finest specimens of Smyrna opium, particularly the peculiar odor like that of poppy flowers; whilst the opium of Bengal, especially that resulting from mixing the exuded juice with the extract, gives out a more or less aromatic mushroom odor. Hardy's opium lost 7·60 per cent. by drying, and yielded 5·02 per cent. of crystallised morphia, deprived of narcotine by ether. Smyrna opium gave with M. Bussy only 4 per cent. of morphia ; and Indian opium, according to M. Payen, yielded 10·7 per cent.

Large Doses of Opium in the Treatment of Acute Articular Rheumatism (Requin). — The example of Dr. Corrigan, who employed opium in large doses in the treatment of acute articular rheumatism with success, has been followed by other physicians. M. Gueneau de Mussy frequently has recourse to it at the Hôtel-Dieu. M. Requin, who has paid great attention to the subject, does not bleed in any case, but administers a one-grain pill of the gummy extract of opium evening and morning, increasing the dose by one pill daily until the pains cease, maintaining or diminishing it according as the disease remains stationary or diminishes, and not abandoning the use of opium altogether, until the pains have disappeared. M. Requin, in his essay, has published eighteen cases, of which the principal results are as follow:—The maximum dose of opium has never exceeded seven pills; dangerous symptoms have never occurred : the mean duration of treatment has been eleven days and a half; the mean duration of the disease, dating from the commencement of the attack, seventeen days and a half. M. Requin observes, that these results are favorable, and prove that opium, while removing the pains, does not in so doing increase the duration of the complaint; but, he adds, they are not sufficient to warrant the abandoning the rational employment of venesection.

Opiated Powder of Guaiacum (Pereira).—Four grammes of porphyrised guaiacum, two grammes of powdered orange-leaves, one grain of acetate of morphia, mixed together, and divided into sixteen packets, one to be taken every two hours in a bechic infusion. Used with success in the treatment of acute articular rheumatism..

Battley's Anti-neuralgie Liquor.—A concentrated aqueous solution of the calysaya cinchona is prepared by digestion, which is evaporated, at the temperature of 106° Fah., to a syrupy consistence. This liquor is readily preserved, but that process may be assisted by the addition of 0·01 of sulphuric ether. The dose is from ten to twenty drops and more, repeated three times a-day, in obstinate neuralgia. Dr. Robarts prefers this liquor to quinine in such cases.

Inoculation of the Salts of Morphia in Neuralgia (Jaques).—Dr. Jaques, of Antwerp, after having failed in treating a very obstinate case of supra-orbital neuralgia in a young girl, by antispasmodics, sulphate of quinine, and the salts of morphia used endermically, bethought him of introducing the sulphate of morphia under the skin, by inoculation. He dissolved half a grain in a little water, and then, having dipped a vaccination needle in the solution, made with it about forty punctures in the painful part. Immediate relief was experienced, and the repetition of the operation for several days effected a perfect cure. A similar proceeding in the course of the sciatic nerve, in cases of sciatica, has been adopted with a like result. Each puncture is followed by an almost instantaneous whitish elevation of the skin, which disappears the next day. The irritation which is produced may be relieved by poultices.

Pills of Morphia and Cyanuret of Potassium (Rougier).—Three grains of sulphate of morphia, six grains of cyanuret of potassium, and mucilage as much as may be needed, to make twenty-four pills; four at first to be taken daily, one every six hours, the quantity being gradually raised to twelve. Used in the treatment of neuralgia.

Narcotic Pills (Barthez and Rilliet).—Four grains of the extract of opium, four grains of extract of belladonna, six grains of thridace (lactucarium), and a sufficient quantity of marshmallow powder, to make fourteen pills, of which three to be taken daily, the dose being gradually increased. Used in cases of intense chorea in children ten years of age.

Powder against Chorea (Bouneau).—Two grains of porphyrised iron, one-fifth to two-fifths of a grain of extract of opium, four grains of dry extract of bark, made into a powder, and taken evening and morning, the dose of iron and opium being gradually increased. This powder has been frequently employed with success at the *hospital for sick children*.

Potion, Anti-dysenteric (Requin).—100 grammes of linden water, 30 grammes of syrup of opium, and the whites of two eggs. A teaspoonful to be taken in the course of the day.

Liniment, Baumés'.—50 grammes of oil of belladonna, 100 grammes of lime-water, 20 grammes of Galen's cerate, 10 grains of hydrochlorate of morphia. Used in the vesicular or puro-vesicular eruptions, which are accompanied by irritation.

Opium Sparadrap (Schaenfelle).—M. Schaenfelle proposes to prepare an opiate plaster to be applied over parts where neuralgic pains are felt, in the following manner :—A piece of thick court plaster is to be stretched on a board by means of small nails, and three successive layers of the gummy extract of opium to be applied over it by means of a brush, one-sixth part of finely powdered gum arabic having been mixed with the extract, with a sufficient quantity of water to make it as thick as syrup. The plaster must be kept in a dry place.

Poisonous Solaneæ. — Conium ; Aconite.—*Use of Belladonna as preservative of Searlatina.*—This medicine, which had been previously recommended by Hahnemann, has been administered by M. Stevenart to 200 persons residing in a district where 96 deaths had already occurred from scarlatina. It was given in small doses for nine or ten days, and the whole 200 escaped the disease. In 145 of these the remedy did not produce any appreciable effect. M. Guersant regards belladonna as prophylactic of scarlatina, and he founds his opinion on numerous facts. He always has recourse to it when he is called in to a family where there is a person affected with scarlatina, and he finds that, as long as belladonna is given, the scarlet fever does not show itself, but it appears when the remedy is withdrawn, but in a very mild form. M. De Lens attended a child affected with scarlatina, and ordered all those who came in contact with it, except the grandmother, to take belladonna. The remedy acted as a prophylactic to those who took it; the grandmother, to whom it was not given, on account of her great age, being the only person attacked by the disease. Dr. Godelle, physician to the Hotel Dieu at Soissons, also places confidence in the preservative power of belladonna in epidemics of scarlatina. The preparations in ordinary use are, three grains of extract of belladonna dissolved in ten drachms of water, of which two or three drops are given evening and morning to children of a year old and under, three or four drops to children two years old, the dose being gradually increased according to the age of the patient, not more than fifteen drops being exhibited to adults; or three grains of powdered belladonna root are mixed with eight scruples of powdered sugar, and divided into sixty doses, of which two or three are given to children a year old, the dose being increased according to the age.

Belladonna in Ophthalmia.—The virous solaneæ constitute a valuable resource in the treatment of different affections of the eye; the remarkable action possessed by the active principle of these plants on the pupil recommends them to the attention of oculists. The extract of the depurated juice of belladonna is used in the Parisian hospitals, and is found very serviceable. M. Ammon has found the following collyrium very valuable in the treatment of the ophthalmia of newly born children :—six grains of extract of belladonna, ten drops of chloruretted water, five ounces of distilled water. A small piece of fine sponge is soaked in this solution when warm, and applied to the eyelids every quarter or half hour, so that the liquid may penetrate to the conjunctiva. The eyes are to be covered with compresses soaked in the solution in the interval. Belladonna is here employed with a double object in view—to relieve the spasm of the eyelids, which prevents the escape of the discharge, and also to dilate the pupil, so that, if the cornea ulcerates and the iris prolapses, there may yet remain a portion of the pupil. This dilatation of the pupil also modifies the turgescence of the anterior chamber, and the tension of the cornea which it produces. The bowels must be kept well open the while.

Suppository of Unguentum Populeum.—(Labordette.)—Fifteen scruples of white wax, forty scruples of unguentum populeum, five scruples of extract of belladonna, mixed together, and divided into ten suppositories. Useful in hæmorrhoids.—*** M. Labordette considers the extract of the fruit of belladonna as much more active than that of the leaves.

Anodyne Ointment (De Bourge de Rollot).—Forty scruples of Galen's cerate, ten scruples of extract of belladonna, four grains of acetate of morphia. M. Rollot employs this ointment in frictions in cases of articular rheumatism and muscular pains.

A new Method of obtaining Conicine (Ville).—Conicine is a liquid vegetable alkaloid, possessing the active properties of conium. The processes hitherto adopted for procuring it are very complicated, but M. Ville has recently introduced a much more simple one, which any pharmacien can readily put into practice. The juice of conium is to be slightly acidulated with sulphuric acid (about four grammes of the acid to 500 of the juice), then coagulated, filtered, and evaporated to one-half, the temperature never being raised higher than 160° F. The liquid is then to be poured

into a vessel with two tubes, one of which—a lateral one—has a cock attached to it; a quantity of caustic potash equal to about one-eighth the weight of the liquid is then to be added, and a layer of ether of equal volume with the aqueous liquid. The potash neutralises the sulphuric acid, and the conicine is set at liberty and dissolved by the ether, the action of which is facilitated by repeatedly shaking the vessel. After about two hours' contact, the separation of the etherial layer is effected by the lateral tube and cock, and the liquid having been received into a retort already prepared on a stove for the purpose, the separation of the conicine is managed by means of a temperature so arranged that the ether alone volatilizes, the conicine remaining as a slightly-coloured, oily, liquid residuum, but in a sufficient state of purity for medicinal purposes. Fractional doses of this may be obtained by dissolving one drop in forty of ether or alcohol; one-tenth of a drop will be a large enough dose to begin with; it may be increased gradually. A *magistral syrup of conicine* may be prepared by adding one drop of conicine and one drop of alcoholized sulphuric acid to fifty grammes of simple syrup. The dose would be a coffee-spoonful. M. Ville states that M. Baudelocque has employed conicine with advantage in certain cases of scrofula. If conicine should ever become an object of commerce, it may serve, with some chance of success, for the revival of Stœrck's researches on the treatment of cancer.

Pills of Conium, Quinine, and Iron (Rognetta).—Ten grammes of the extract of the small officinal conium, prepared without heat, five grammes of sulphate of quinine, ten grammes of carbonate of iron. To be divided into 100 pills, silvered; one, two, three, or four to be taken daily, according to their tolerance, in cases of uterine catarrh.

Sedative Ointment (Rognetta).—Eight grammes of extract of the small officinal conium, eight grammes of extract of stramonium, one gramme of extract of belladonna, thirty grammes of rose ointment. To be applied to the cervix uteri, and in frictions on the hypogastrium in uterine catarrh.

Plaster of Conium (Mouchon).—M. Mouchon, considering that the resinous substances introduced into the formula of the emplastrum conii of the Codex must injure the sedative influence of the application, and also that the conium is in too small a proportion, adopts the principle of the modification proposed by M. Planche, who made the plaster with the alcoholic extract of conium combined with the resin elemi and white wax. As, however, the resin elemi, which is becoming more and more rare and impure, is also subject to the same objections as the old formula, M. Mouchon proposes the following:—Sixteen parts of alcoholic extract of conium, six parts of fresh cacao butter, six parts of pure white wax, and four parts of oil of conium. The cacao butter, wax, and oil are melted together in a water bath at the boiling heat, and the extract, rendered almost liquid by a little alcohol, at 21°, is afterwards added. M. Mouchon observes that this formula will serve equally for the preparation of the plasters of *belladonna*, *opium*, *aconite*, &c.

Anti-neuralgic Pills (Coste).—Four grains of the alcoholic extract of the aconitum napellus, divided into four pills, one to be taken every three hours. Used in simple neuralgia, in which pain is the chief symptom. If the prescribed dose is insufficient, M. Coste says the remedy should be at once abandoned, and another had recourse to.

Ointment against Sciatica (De Bourge de Rollot).—Forty grammes of stibiated ointment, five grammes of extract of aconite, mixed together, and used in frictions in the course of the nerve.

Strychneæ.—Strychnine and the alcoholic extract of nux vomica are not only employed daily in the treatment of hemiplegia and the different forms of paralysis, but have also been had recourse to in the treatment of other nervous affections with advantage. Their latest application has been in cases of chorea and obstinate gastralgia, for which purpose, however, Recamier has long employed pills of brucine, in the dose of one-fifth to two-fifths of a grain. M. Bouchardat observes, as a new proof of the connection between strychnine and brucine, that when studying the optical properties of the vegetable alcaloids, he ascertained that the solutions of strychnine and brucine in neutral solvents acted on polarized light. Both these bases have a rotary molecular power, which is exerted towards the left, but the energy of the power of strychnine is exactly double that of brucine. If an acid be added to the solution of strychnine, that power immediately decreases in a remarkable manner; and if an acid be added to the brucine solution, the diminution of power takes place in a proportional degree.

Nux Vomica in the Treatment of Chorea.—Professor A. Trousseau has published several cases of chorea cured by the alcoholic extract of nux vomica in one-grain doses, gradually increased, or by strychnine, given at first in one-fifth of a grain doses, also gradually increased.

Pills against Gastralgia (Boudin).—Eight grains of freshly prepared alcoholic extract of nux vomica, made into sixteen pills, and silvered. Four, eight, and even sixteen, may be taken in the course of the day, but gradually, the patient beginning with the smallest dose, and not taking many at a time. The radical cure of obstinate gastralgiæ, which have resisted ordinary remedies, may be thus often obtained in a few days. It is remarkable that patients, when taking this medicine, often experience well-marked aphrodisiac effects.

Anti-gastralgic Draught (Boudin).—Three-fifths of a grain of strychnine, 120 grammes of water, one drop of hydrochloric acid, thirty grammes of syrup of mint. To be taken by spoonsful every two hours.

Strychnine Ointment (Sandras).—One gramme of strychnine, thirty grammes of lard, mixed carefully together. Used in frictions on the paralytic hands of workmen in lead, painters, and potters. Cures have been obtained after months of treatment by the use of this ointment, which causes to disappear at the same time the hard swellings noticed on the backs of the hands of these paralytics.

Secale Cornutum.—M. Bonjean de Chambery perseveringly continues the researches on the secale cornutum, for which the Society of Pharmacy has already presented him the gold medal. The following is the modification he employs in the preparation of the extract of ergot of rye, which he calls *ergotine*, taken from a communication forwarded by him to the Academy of Sciences.

Preparation of Ergotine.—Powdered ergot is exhausted by water by the method of displacement, and the aqueous solution heated in a water bath. It sometimes coagulates from the presence of albumen, but not always. The coagulum is to be removed by filtration, after which the filtered liquid is concentrated in a warm bath to the consistence of clear syrup, and then alcohol added greatly in excess, so that all the gummy matters are precipitated. The mixture is then set aside for a time until the precipitation is completed, and the liquid has resumed its transparency and limpidity, after which it is decanted, and reduced in a water bath to the consistence of soft extract. If a coagulum does not form, the aqueous solution is at once brought to a semi-syrupy condition, and treated by alcohol, as just directed, in order to obtain the extract. By this process, a soft red or brown homogeneous extract is procured, possessing an agreeable roast meat odour, and a rather piquant, bitter taste, somewhat analogous to that of spoiled wheat. It forms with water a fine red limpid and transparent solution. 500 grammes of secale cornutum yield 70 to 80 grammes of extract. Ergotine is a real specific against hæmorrhages in general. Bonjean says the immediate effects ergotine produces on the most violent menorrhagias is surprising—obstinate vomitings of blood yield in a very short time to its employment, and relapses generally are very rare, especially when its use is continued for some time after the cessation of symptoms. To show that ergotine is also the obstetrical principle, all that is requisite is to treat the powdered secale with ether by displacement, until complete exhaustion of all matters soluble in that menstruum. All the poison is thus extracted, that is, the oil and resin, there remaining only a powder which is no longer unctuous, but rough as sand, without any unpleasant taste or toxic action, and which excites uterine contraction, in the dose of twenty to twenty-five grains, in all the cases of inertia of the uterus in which its exhibition is deemed advisable.

Ergotine Mixture (Bonjean).—One gramme of ergotine, 100 grammes of common water, thirty grammes of syrup of orange flower. A spoonful to be taken daily in cases of hæmorrhage, and every quarter of an hour in inertia of the uterus, until the expulsive pains have terminated the labour. This dose is generally sufficient to arrest an ordinary hæmorrhage; but when those alarming losses of blood which sometimes follow labour are to be combatted, the mixture should contain five or ten grammes of ergotine, according to the nature of the case, and should be exhibited in spoonsful, at short intervals, until all danger has disappeared.

Syrup of Ergotine.—Ten grammes of ergotine, dissolved in thirty grammes of orange-flower water, and 500 grammes of boiling simple syrup. Thirty grammes of this syrup contain ten grains of ergotine. Dose, two to four spoonsful daily, or more, according to the urgency of the case.

Pills of Ergotine.—Five grammes of ergotine, and liquorice powder as much as is requisite to make sixty pills, of which from six to ten to be taken daily.

M. Bouchardat objects to the term ergotine, adopted by M. Bonjean, which he thinks inapplicable to a compound body, nor does he admit that M. Bonjean has succeeded so closely as he thinks he has in separating the toxic from the medicinal principle of ergot. The attempt has been made before by other chemists on other important medicines, but he considers it must always be a failure, as the therapeutic properties of a drug are always dependant on the physiological properties.

Use of the Aqueous Extract of Secale Cornutum in some cases of chronic disease of the uterus (Arnal).—Thirty-six patients affected with engorgement of the uterus have been treated with the extract of the ergot of rye. The daily doses taken by these patients varied from two to six grains, and even a gramme, in the form of pill, for months together. As each grain of this extract is equal to five of the powdered secale, it follows that some patients have taken nearly eight grammes and a half of the powder in the twenty-four hours; nevertheless, not one of them experienced any dangerous symptoms. The medium duration of treatment was three months.

Pills against Dartrous Ulcerations (Arnal).—Six grains of the aqueous extract of secale cornutum, four grains of the ioduret of sulphur, made into four pills, to be taken in cases of ulceration of the neck of the uterus of dartrous origin.

Pills of Conium and Secale (Arnal).—Six grains of the aqueous extract of secale cornutum, four grains of extract of conium, to be divided into four pills, and taken at first in two days, afterwards in one, to relieve the enteralgia which occasionally accompanies the use of secale cornutum.

Pills of Ergot and Ioduret of Iron (Arnal).—Four grains of ioduret of iron, and four grains of extract of ergot, divided into four pills, to be taken during the day by chlorotic or lymphatic women, or such as are exhausted by uterine catarrh.

Cyanic Compounds.—*The Cyanuret of Potassium* (Orfila).—The cyanuret of potassium is at present much employed in galvano-plastic, and, used imprudently, has this year caused a case of poisoning. On this account M. Orfila has published an essay on this product, the principal results of which will be given here. The first mode of preparation to which Orfila alludes is that of Wiggers; it consists in passing a stream of hydrocyanic acid through an alcoholic solution of pure potash. The product is solid, white, and possessed of an acrid, alcaline, bitter savour; it has a strongly marked odor of hydrocyanic acid—is not decomposable at the highest temperature, unless it be exposed to the air—is decomposable at a white heat, if there be contact with the air—is very soluble in water, and less so in alcohol. Weak acids set the hydrocyanic acid free *without effervescence*. Its aqueous solution restores the blue colour of reddened litmus paper, and is not rendered turbid by lime water; the sulphates of the protoxide and sesquioxide of iron give preci-

pitates of a blue colour, or which acquire that tint on the addition of a few drops of hydrochlorie acid; the sulphate of the binoxide of copper, if employed in sufficient quantity, gives an *apple-green* precipitate, which changes to white when a small proportion of hydrochlorie acid is added, and the liquor remains opaline; the nitrate of silver throws down the cyanuret of silver. One gramme of freshly prepared cyanuret of potassium will furnish one gramme seventy-two centigrammes of cyanuret of silver. The process directed in the codex consists in decomposing the cyanuret of potassium and iron by heat in closed vessels. The product is less pure than the preceding; it offers nearly the same characters, but it contains a little carbonate of potash, and on that account it gives a white precipitate with lime water, and produces an effervescence of carbonic acid when it is decomposed by an acid. A third species of cyanuret of potassium is prepared in large quantity, and at a low price, by calcining flesh or dried blood with potash at a white heat. It is of use in the arts, because it easily dissolves the cyanurets of gold, silver, and platina; but it has scarcely any odor of hydrocyanic acid, and each gramme only affords six centigrammes of cyanuret of silver, instead of one gramme seventy-two centigrammes, which can be obtained from the cyanuret of potassium of good quality. It also effervesces freely with acids, and gives an abundant precipitate with lime water. Ordinary reagents scarcely show any traces of the presence of hydrocyanic acid.—*** Cyanuret of potassium, whether prepared according to Wigger's process or by calcining the yellow cyanuret of potassium and iron, is an exceedingly energetic poison, capable of causing speedy death in the dose of a few centigrammes; it acts precisely in the same manner as hydrocyanic acid. The pretended cyanuret of potassium, obtained by calcining dried muscle with potash, such as is sold by some manufacturers of chemical products, and by some pharmaeicns, contains *scarcely any cyanuret;* it is formed principally of carbonate of potash, the chlorurets, &c.: it is very slightly injurious, exercising the same action as the carbonate of potash on the animal economy. If it be true that a concentrated aqueous solution of the cyanuret of potassium is decomposed into ammonia and the formiate of potash, when it is boiled in a close vessel, the decomposition takes place so slowly that the salt is not entirely changed after boiling for three hours and a half. If the cyanuret of potassium is decomposed by the simultaneous action of the water and carbonic acid contained in the air, when it is in contact with that agent, this decomposition is not complete at the end of a rather long time, since, after the lapse of a fortnight, the cyanuret of potassium, which had been almost liquefied by the atmospheric humidity, still possessed energetic toxic properties. With regard to the means of distinguishing the cyanuret of potassium in medico-legal researches, when mixed with medicines or food, after a little acetic acid has been added, distillation must be had recourse to, and the product collected in a cold solution of the nitrate of silver, which will indicate the presence of hydrocyanic acid by the formation of cyanuret of silver.

Anti-epileptic Potion (Lemoine).—Sixty grammes of distilled linden water, ten grammes of distilled cherry-laurel water, thirty grammes of syrup of orange flower, and twelve drops of liquid ammonia. Three spoonsful to be taken daily. M. Lemoine mentions several epileptic patients cured or relieved by the use of this medicine. A somewhat similar formula has been published in the name of M. Delanglard, who received it from M. Pinel-Gran-Champ.

M. Brachet strongly recommends ammonia in the dose of fifteen drops in a glass of water in delirium tremens.

Anti-epileptic Pills of M. Bourge de Rollot.—Ten grammes of Prussian blue, and ten grammes of oxide of zinc, made into 100 pills, one to be taken every morning fasting for the first week.

Poisoning by Bitter Almonds (Schlesler).—A little boy, two years and a half old, and a little girl, five years old, eat about one hundred grammes of bitter almonds. The boy, who was playing a quarter of an hour previously, was lying down, pale, face contracted, features distorted, pupils dilated, respiration sighing; there was continued somnolence, and a remarkable relaxation of all the limbs. He had vomited several times, and had thrown up a large quantity of bitter almonds, coarsely masticated, which were easily recognized by the strong odour of prussic acid they exhaled. The little girl, who had eaten a smaller quantity, was affected in the same way as her brother, but to a less degree. Their bodies were sponged all over with cold vinegar lotions, and powerful emetics were given every quarter of an hour until the entire contents of the stomach were ejected, and the butter and water which they were made to drink freely to assist the action of the emetic was returned pure, and without any odour of bitter almonds. Sugared water, with a few drops of ammonia, was then given several times; the little patients were brought out into the open air, and at the end of a few hours they perfectly recovered.

The Employment of some Cyanic Compounds in the Treatment of Diseases of the Eye (F. Cunier).—Messrs. Turnbull and Guthrie, jun., of London, have already employed several cyanic compounds in the treatment of diseases of the eye. M. Florent Cunier, principal editor of the "Annales d'Oculistique," has published, in the August number of his journal, an essay on that subject. The following are the formulæ which he employs:—

Hydrocyanic Collyrium.—One gramme of medicinal hydrocyanic acid, 100 grammes of distilled belladonna water. Some drops are instilled between the eyelids, and muslin compresses, wetted with it, are applied against the eyelids, and renewed every half hour. Used to relieve intense photophobia, accompanied by epiphora and spasm of the eyelids.

Collyrium of Cyanuret of Potassium.—Four grains of cyanuret of potassium, thirty grammes of distilled belladonna water. Used under the same circumstances.

Ointment of Cyanuret of Zinc.—Four grains of cyanuret of zinc, five grammes of lard or cacao butter. A piece as large as a bean to be rubbed every quarter of an hour on the forehead, temples, and eyelids.

Ointment of the Essence of Bitter Almonds.—Five grammes of the essence of bitter almonds, five grammes of cacao butter. A piece as large as a pea to be rubbed in gentle frictions every hour on the forehead and temples. Used in cases of glaucoma and iritis to relieve the neuralgic pains.

A most remarkable thing, says M. Cunier, in the employment of these new agents in ophthalmic medicine is the promptitude with which the use of cyanic instillations determines the cicatrization of ulcers of the cornea, and brings about the absorption of effusions which are always so slow to disappear. M. Cunier advises the employment of these preparations to be restricted to cases of this kind, and to loss of transparency of the cornea. He prefers the cyanuret of zinc, as least dangerous to use, and also least variable in its effects. The employment of distilled cherry-laurel water produces effects identical with those above described. The hyposthenic action of this water is in a ratio to the proportion of hydrocyanic acid which it contains, but its contact with the eye is almost always too painful for it to be had recourse to where there are ulcers on the cornea. M. Cunier thinks it has been of service in the treatment of leucoma by incisions; in such cases, and in some instances of inveterate pannus, alone can its instillations be borne.

The *essential oil of bitter almonds*, and that of the *cherry-laurel*, can only be employed in the treatment of neuralgic pains. Introduced between the eyelids, they produce a very severe and prolonged burning pain, and their effect on the eye or on ulcerations of the cornea is nul, or almost so.

Hydrocyanic Acid; its Use in Vapor in Diseases of the Cornea (Catterson).—A young patient had the left cornea almost entirely opaque, and the luminous rays only passed through a small transparent segment at the upper part of the organ. Mr. Catterson submitted both eyes to the action of the vapor of hydrocyanic acid, and he affirms that he has never obtained such extraordinary results from any other means. The lymph effused between the layers of the cornea was soon absorbed, and the cornea speedily reassumed its transparency. The pupil enlarged with the same rapidity, and after a month's treatment the patient could see sufficiently well to guide herself in walking.

ANTISPASMODICS.—*Remarks on the Employment of Chloroforme as an Antispasmodic for Asthmatic Persons.* (Natalis Guillot, physician to the hospital for old men.)—This medicine is a very dense, limpid liquid, as transparent as water. It is obtained by the distillation of alcohol and the chlorure of lime dissolved in water. Alcohol and ether dissolve it readily; water precipitates it. M. Guillot administers it in the following manner: about four grammes of the chloroforme are added to 400 grammes of distilled water; the two liquids are then violently shaken together in the flask, and after having been set aside for a quarter of a minute, one or more spoonsful are given to the patient, and the dose repeated, according to the case, two or four times a-day, more distilled water being added when the first quantity has been exhausted. Each spoonful, therefore, contains a notable quantity of distilled water, plus a small dose of chloroforme, the precipitation of which to the bottom of the water had not been perfectly effected. The medicine was first exhibited to persons in good health, so that it was afterwards given to the sick without fear. Healthy persons have taken as much as 200 grammes of distilled water, holding in suspension a notable quantity of chloroforme, and they have not experienced any inconvenience from the dose. The medicine has a saccharine, slightly alcoholic savour, very analogous to that of the ethers. The asthmatic patients to whom it was administered took it with pleasure, and some even asked for a repetition of the dose, finding considerable relief from its exhibition; others did not appear to have received so much benefit. Nevertheless chloroforme may be regarded as an antispasmodic, presenting considerable analogy of composition and action with the ethers.

Etherized Water regarded as a Solvent, and as a Preservative Agent.—Neutral solvents are extremely valuable in chemical and pharmaceutical analysis, because they serve to isolate with facility the different immediate principles which enter into the composition of products proceeding from organized bodies. They are of more service than either acid or basic solvents, because the matters which they hold in solution are generally obtained intact, not having undergone any of those varied transformations which are so common with the acid or alcaline solvents. Water is an admirable solvent, employed with great advantage in various chemical and pharmaceutical preparations: unfortunately, as soon as it is charged with some organic principles, it does not prevent their spontaneous decomp osition, either by the oxydizing influence of the air, or by the constant presence of those animated germs which soon substitute, by the continual transformations which they c use organized m atter to undergo, other principles for those which existed in the solution. By the process about to be detailed, water preserves all its solvent powers, and yet any ulterior alteration of the dissolved principle is prevented. M. Bouchardat has long observed that water, saturated with ether, or even surcharged with a slight layer of that liquid in excess, was a very simple and convenient means for preserving delicate objects, without other alteration than that which the solvent itself produces. All that is requisite is to have a well-closed vessel. This absolute preservation of organized matter from spontaneous decomposition, under the influence of etherized water, leads M. Boucharda to hope that in future this economic liquid ma prove an agent of solution, uniting the principal advantages of water without the inconveniences resulting from the speedy decomposition of the matters dissolved, or held in suspension. In the same way may be prepared macerations, digestions, lixiviations, &c., charged with the principles soluble in water. These may be employed directly when ether is not contra-indicated, or the dissolved matters may be re-obtained from the liquid without alteration. M. Bouchardat also expects that this new solvent may be usefully employed in the preparation of many *active extracts*, especially when

an apparatus for effecting evaporation *in vacuo* can be used. We shall then obtain the representation of principles soluble in a proper menstruum, without any alteration. for, by the nature of the solvent, we avoid the spontaneous decompositions which so frequently occur in all aqueous solutions, and which commence almost immediately the water is in contact with an organized substance, and by the employment of a vacuum, the decompositions resulting from the use of heat are avoided. The apparatus at present in use for the evaporation of extracts *in vaeuo* allow of the re-collection of the ether employed in each operation, so that the increase of expense will be as trifling as possible. M. Bouchardat is further of opinion that etherized water will enable the anatomist to preserve objects of a delicate texture, if he take the precaution to dissolve in the water either a little sugar or another principle, in order to give the water an endosmosic coefficient, exactly equal to that of the matter he wishes to preserve. Etherized water may also be used with advantage in the macerations which are employed in the researches on microscopic anatomy, in order to set free the elementary tissues. He will thus avoid the spontaneous decompositions which produce infectious liquids, and which often change the forms of tissues, either by the development of new beings, or by the ravages that these microscopic hosts cause in the normal tissues.

Tisane of Chenopodium Ambrosoïdes (Rillier and Barthez).—Four grammes of chenopodium ambrosoides, infused in 500 grammes of water, and fifty grammes of syrup of orange flower added. Used in the chorea of infancy.

Antispasmodic Potion (Wendt).—Five grammes of bruised valerian, infused in 100 grammes of water, and eight grammes of musk, ten grammes of tincture of amber, and twenty grammes of syrup of orange flower added. To be taken by spoonsful every half hour in cases of spasmodic laryngitis. Assafœtida lavements are prescribed at the same time.

Cochineal Potion (Wachtl).—Two grains of powdered cochineal, five grammes of sugar, twenty grammes of water. To be taken in three doses in the twenty-four hours. Recommended in hooping cough.

Antispasmodie Lavement (P. de Mignot).—twenty grammes of bruised valerian, infused in 500 grammes of water, strained, and a grain of gummy extract of opium dissolved in it; two grammes of sulphuric ether are added to the cold solution. Used to obtain the reduction of hernia. *Etherial irrigations*, as advised by M. Véla, may be practised at the same time.

Anti-epileptic Pills (Recamier).—One grain of oxide of zinc, three-fifths of a grain of extract of belladonna. To be made into a pill, to be taken evening and morning. Flying blisters were applied at the same time to different parts of the body affected with paralysis or formication. The treatment was followed by cure.

Use of Camphor (Raspail).—Raspail has great confidence in camphor, and in the new work which he has published, he points out many applications of this agent.

Scraped Camphor.—This powder is used like snuff in coryza, megrims, frontal and superciliary headaches, &c. Sprinkled on the orifice of a mucous membrane, it destroys the parasites which may have been accidently produced in them, &c.

Camphor Cigarettes.—Camphor may be smoked in quills, straws, or other convenient instruments, all the precaution that is needed being to introduce the lumps of camphor in the tube without heaping them, and to keep them separate from contact with the saliva by a diaphragm of joseph paper. These cigarettes are generally smoked cold, but if the temperature is very low, the cigarette should be warmed from time to time in the palm of the hand. Camphor cigarettes are used in cases of colds, hooping-cough, obstinate coughs, and asthma. Raspail also recommends them as stomachic and aperient, as a sedative in cramps of the stomach, and even of service in the treatment of thrush in infants at the breast.

Camphorated Alcohol.—A quart of alcohol at 40°, sixty grammes of camphor. Raspail occasionally recommends a hectogramme of camphor to a quart of alcohol, and sometimes even sufficient to saturate it. This liquid may be applied by compresses wetted with it over the region of the heart, to moderate nervous palpitation, and over the abdomen to relieve verminous colic.

Camphorated Ointment.—Three parts of lard, melted in a water bath, and one part of powdered camphor added; the ointment must be continually stirred until the camphor is dissolved.

Camphorated Oil.—Five parts of oil with one part of camphor dissolved in it.

Use of Camphor in Diseases of the Skin (Baumés).—Camphor, says M. Baumés, shews itself generally advantageous as an external application in chronic cutaneous eruptions. It modifies and favourably excites the nutritive life perverted, or somewhat even deadened, in these eruptions, and tends to allay the itching which so often accompanies them. He often employs, in advanced and stagnant, vesicular, or purovesicular, and papular eruptions, when unattended with evident symptoms of inflammation, only a camphorated cerate, prepared as follows:—Thirty grammes of simple cerate, and two grammes of powdered camphor.

STIMULANTS.—*Essence of Turpentine in Epilepsy* (Tessier).—Many physicians still employ the essence of turpentine in the same manner Durande did, as an useful stimulant to assist the excretion of biliary calculi, or to combat certain chronic abdominal engorgements. This essence is also used, according to Recamier and Martinet's practice, as an efficacious remedy in sciatica, and latterly M. Tessier, acting on a suggestion of M. Foville, has prescribed it in cases of epilepsy, in which it has succeeded, if not in preventing, at least in retarding the fits of this cruel disease. As all the different preparations of turpentine have the inconvenience of not masking its very unpleasant taste, he uses the following electuary, which can be given, he says, with the greatest facility:—Ten grammes of gum arabic, mixed with ten grammes of water, and fifty grammes of white honey, fifty grammes of essence of turpentine, with a sufficient quantity of carbonate of magnesia added. The dose is from two to ten grammes daily. M. Rayer combines a small quantity of opium with it—about ten to twenty drops of Rousseau's laudanum for the full quantity of electuary made according to the prescription.

Medieal Employment of Naphthaline.—Naphthaline is a bicarburet of hydrogen, and was discovered by Reichenbach among the products of the distillation of pitch. Many attempts have been made recently to employ it usefully, and M. Dupasquier has ascertained that when one-fifth or two-fifths of a grain of naphthaline is placed in contact with the tongue, that a strong, acrid, and disagreeable taste is soon experienced, followed by a sensation of gradually increasing heat, extending from the velum palati and superior extremity of the pharynx to the mucous membrane lining the bronchi, and which changes to an unpleasant pricking, by which cough is speedily produced, and then expulsion of mucus, if there is any in the air-tubes. This effect is infinitely more marked with naphthaline than with gum ammoniacum, balsam of Tolu, benzoic acid, &c., which are regarded as the most powerful expectorants, and for this reason M. Dupasquier is of opinion that this bicarburet of hydrogen may be ranked in the first class among expectorants. Clinical observation has confirmed his opinion. Naphthaline, when employed in those cases in which stimulation of the bronchial mucous membrane is requisite and even urgent, has produced excellent results—for instance, with weak old men, labouring under chronic pulmonary catarrh, and in a state of approaching suffocation, from their inability to expel the mucus or glutinous matters obstructing the bronchia. The following are M. Dupasquier's formulæ:—

Naphthaline Looch.—No. 1 of white looch, and half-a-gramme to two grammes of naphthaline. Naphthaline, being insoluble in water, must be saturated a long while with the gum, in order to obtain it in a state of minute division, and especially in order that it may remain in a state of suspension a long while. The dose is a teaspoonful every quarter of an hour.

Syrup of Naphthaline.—One gramme of naphthaline dissolved in the smallest quantity possible of nearly boiling alcohol, then triturated with 125 grammes of simple syrup. Naphthaline is completely dissolved in alcohol by heat, but it is precipitated when mixed with syrup, making it turbid, and like syrup of orgeat in appearance.

Naphthaline Lozenges.—Five grammes of naphthaline, 500 grammes of sugar, and a sufficient quantity of tragacanth mucilage and essence of aniseed. Of this lozenges, weighing one gramme each, are to be made, and used in the same manner that Tolu lozenges are, in cases of chronic pulmonary catarrh. They excite expectoration better than the latter. Twenty may be taken daily.

Copaiba Sugar-plums (Fortin).—Thirty grammes of pure copaiba, twenty-four grains of calcined magnesia, mixed carefully together, and, at the end of twenty-four hours, divided into seventy-two parts, which are then rolled between the fingers, and covered with gum and sugar, for which purpose a gum water, containing one-third its weight of gum arabic, and powdered sugar are prepared. The copaiba pills are placed in a round tinned vessel, heated to 50°, and a little gum water is poured upon them to moisten them, and then the powdered sugar is added, after which the vessel is shaken round and round, so that every part of the pills is well covered with sugar. This process is repeated three times, after which the pills are put on a hair seive, and placed on a stove at the temperature of 90° Fahr. Any other kind of pills may be covered with powders in the same way.

Anti-gonorrhœal Drops (Eisenmann).—Fifteen grammes of copaiba, four drops of essence of mint, one drop of essence of cloves, two grammes of tinctura thebaica. Dose, twenty to thirty drops three times a-day, in half a cupful of sugared water.

Purified and Solidified Storax (H. Lepage).—120 grammes of purified storax, ten grammes of hydrate of lime, mixed together, and heated in a warm bath for an hour. This quantity will make 244 boluses, of which from five to twenty may be given daily in blenorrhagia. Numerous observations have shown to M. Lepage that purified storax may replace the balsam of copaiba.

Treatment of Gonorrhœa by Piteh and Alum (A Berton).—M. Berton employs in the treatment of this disease a compound of equal parts of pitch and alum, divided into boluses weighing two or three grammes, a sufficient quantity of marshmallow powder having been previously added. A small quantity of camphor or opium may be added, if necessary, to diminish the sensibility of the intestinal canal, and prevent nocturnal erections. From two to five grammes of this preparation are given daily, and the dose may even be doubled. The inflammatory state must be removed before this medicine is had recourse to. Thirty-three individuals have been treated with the ordinary balsamic remedies, copaiba and cubebs, and forty-five with the pitch and alum: the medium duration of treatment for the first has been 12·7, for the second 12·4.

Syrup of Orange-peel (Laroze).—130 grammes of the hydro-alcoholic extract of curacoa, 220 grammes of distilled water, and 7,200 grammes of syrup of Provence honey.

Sal Ammoniac Potion.—Five grammes of liquorice root, infused in 120 grammes of water, and two grammes of sal ammoniac, with thirty grammes of syrup of marshmallows added. M. Wendt particularly prescribes this potion in infantile typhoid fever, when the inflammatory symptoms have passed away. It is also used in Germany to combat the tubercular diathesis.

Powder against Amenorrhœa (Tsuhierchki).—Two grains of extract of the taxus baccata, one grain of calomel, ten grains of white sugar, one drop of essence of savine. The dose to be taken evening and morning.

Anti-rachitie Syrup (Vanier.)—150 grammes of ray-liver oil, fifty grammes of the extract of walnut leaves, 800 grammes of honey, five grammes of water, five grammes of ioduret of potassium, 500

grammes of syrup of bark, 1,000 grammes of simple syrup, five drops of essence of aniseed.—*** A spoonful to be taken in the morning fasting. M. Vee says with truth that this formula is very complicated, and that the ray oil separates from the syrup, and renders it very disagreeable.

Walnut Pills (Sandras).—Five grammes of extract of walnut-leaves, made into fifty pills with a sufficient quantity of marshmallow powder. Four to be taken daily, from twenty to forty drops of tincture of iodine being given at the same time. Used in cases of scrofula, of which M. Sandras describes many cases of cure, which have been effected even without the iodine.

Tonic and Detersive Decoction (Baumès).—120 grammes of walnut leaves and 750 grammes of water, boiled down to 500 grammes. This decoction appears to M. Baumès of service in cleansing chancrous sores, to stimulate them gently, and induce cicatrization. He often employs it in the place of aromatic wine with advantage.

Diuretics.—Counter-stimulants.—*Action of Digitalis on Chickens* (Bonjean).—M. Bonjean has performed several experiments establishing the fact that digitalis, which is so active a poison when administered to dogs, is altogether innocuous when given to chickens, even in the dose of fifty grammes. The study of the comparative action of poisons on man and the inferior animals has already made known many analogous facts; but in order that those relative to digitalis should be received without restriction, experiments should be performed with its active principle. M. Bonjean, in his memoir, makes observations on the pharmaceutical preparations of digitalis, but the discovery of digitaline, and the history of its properties, will definitively fix the opinions of pharmacologists on that subject.

Analysis of Digitalis (Morel).—M. Morel has just published a new analysis of digitalis, the principal results of which are as follow:—Digitalis does not contain any peculiar alkaline principle, but a bitter neutral matter, soluble in water and alcohol, and having some analogy with crude emetine; a waxy matter, soluble in ether, tartaric acid, &c. The principal result observed by M. Morel is correct; the active principle of digitalis is, in fact, a neutral substance, but he did not obtain it in a state of purity, as the following paragraph will show.

Digitaline.—The active principle of digitalis, which has been so long sought for, and so often announced by different chemists, has been at length isolated. This discovery forming the subject of a prize, and the results of the concours not being as yet known, the details must be deferred to the Annuaire of next year. Nevertheless it may be stated that digitaline is a neutral product, presenting itself in the form of a white powder, and of a confused or amorphous crystallization; scarcely soluble in water, insoluble in ether, very soluble in alcohol, of an intense bitter taste, possessing a special action on the central organ of circulation, the pulsations of which it diminishes in a remarkable manner, and of such energy that it would be impossible to give it except in extremely fractional doses,—1-50th to 1-25th of a grain, repeated two or three times a-day; rarely more. Well-marked physiological effects may be observed from its use.

Pills of Squill, Digitalis, and Iron (Chomel).—Two grammes of squill powder, two grammes of digitalis powder, four grammes of porphyrised iron, made into forty pills, of which from two to six to be taken daily, in cases of albuminuria complicated with chlorosis.

Vendt's Potion.—Eight grammes of tartrate of potash and two grammes of nitrate of potash dissolved in 120 grammes of barley-water, with fifty grammes of syrup of mulberries added. To be taken by spoonsful every hour in the typhoid fever of children from four to six years of age.

Nitrate of Potash in large Doses in Rheumatism (Forget).—Among the medical men who have ascertained the utility of large doses of nitrate of potash in rheumatism may be mentioned Gendrin, Martin-Solon, Stœber, &c. &c. Forget observes that it is especially adapted for cases of acute articular rheumatism of medium intensity, or occurring in lymphatic subjects of weak, irritable constitutions, unable to bear any loss of blood, and even in such cases there are often mistakes. Nitrate of potash in large doses is a useful remedy, which deserves to be retained in the therapeutics of articular rheumatism. It may be given in the dose of ten to fifty grammes in a quart or two of tisan. It is rare that any unpleasant symptoms are excited by such doses, but nevertheless it would be better perhaps not to exceed twenty or thirty grammes.

Use of Nitrate of Potash against Incontinence of Urine (Young).—Mr. Young has successfully employed the nitrate of potash in the dose of a gramme and a half in the course of the day, taken at three times, to combat incontinence of urine in a child ten years old. The salt acts, according to him, by stimulating the bladder and its sphincter.

Decoction of Marchantia (Levrat Perroton).—Fifty grammes of marchantia conica, a quart and a half of water, reduced by gentle boiling to a quart. Recommended in the treatment of gravel, in the dose of two quarts daily. M. Gensoul has long employed the marchantia as a diuretic, for which purpose it was formerly much used.

Emetics.—Counter-Stimulants.—*Treatment of Croup* (Valleix).—M. Valleix states that, out of 53 cases, tartarized antimony and ipecacuanha were employed in 31 cases, as the principal remedies, and of these 15, or nearly one-half, were cured. In 22 cases, on the other hand, emetics were given very sparingly, and only one cure was effected. To obtain the full efficacy of tartarized antimony it should be employed with more energy and perseverance than is usually the case. It should be given in a potion containing from one to three grains, according to the age, being administered by spoonsful every quarter of an hour, unless symptoms of poisoning supervene. M. Valleix thus sums up the treatment of croup—one or more bleedings when possible, one or more applications of leeches to the neck, the uninterrupted exhibition of tartar emetic, cauterization of the fauces with the nitrate of silver, and topical revulsion when febrile action is not very severe, and mercurial frictions. All these means should be employed at once, and continued until quiet respiration, the cessation of fever, and of other general symptoms shew a real amendment in the local lesion.

Expectorant and Sedative Julep (Sandras).—100 grammes of simple julep, 20 grammes of syrup of diacodium, 0·05 of a gramme of tartar-emetic. This julep is principally employed in cases of chronic bronchitis passing into the acute state, when the dry and frequent cough and dyspnœa indicate irritation of the bronchia. It is particularly appropriate in the state in which phthisical patients sometimes are, when the cough presents the above-mentioned characters, and a fine subcrepitant râle is heard by auscultation around the cavities. Patients generally bear it very well, even from the first day, especially if they are advised not to drink, while they are taking this potion by spoonsful every hour. This precaution is generally not necessary after the second or third day, and patients very often take this potion daily for a month or six weeks with advantage, without ceasing to eat two or three meals a-day. This medicine is counter-indicated in violent hæmoptysis, and also in the obstinate diarrhœas which often complicate phthisis. This latter, however, is not an absolute reason for abandoning its use; and phthisical diarrhœa, when it is not very violent and continuous, has been arrested several times by the second or third day of treatment. When the pulmonary irritation is more marked, the dose of tartar-emetic may be raised to 0·1, and even to 0·2. These latter doses are also useful in pulmonary emphysema, as they decidedly facilitate the almost suppressed expectoration, and, by quieting the pulmonary irritation, they diminish asphyxia in a notable manner.

Large Doses of Tartarized Antimony in Pneumonia (Sandras).—Tartarized antimony, in the dose of 0·4, 0·6, or even 0·8, given in the form of julep containing more or less diacodium, according to the tolerance, has almost always enabled M. Sandras to dispense with venesection. It is very often not tolerated the first day, but it generally is the second, and M. Sandras is never so certain of its good effects as when it does not produce either vomiting or diarrhœa. It is remarkable that diarrhœa, which is sometimes a very annoying complication of pneumonia, is one of the symptoms which yields the readiest and most certainly to the above-mentioned doses of tartar-emetic. M. Sandras has very often seen the cure of pneumonia in the third degree commence by the removal of the diarrhœa, the disease being combated solely by this remedy.

M. Lallemand often employs large doses of tartar-emetic in traumatic lesions with great advantage.

ON THE SULPHITES.

BY DR. JAMES SHERIDAN MUSPRATT, OF LIVERPOOL.

[For the Medical Times.]

At the intimation of my esteemed preceptor, Professor Liebig, to whom I am greatly indebted for many valuable suggestions, I undertook in May last the interesting investigation of the salts of sulphurous acid, in order to study the principal circumstances under which they were produced, and also to ascertain whether their composition and crystalline form were analagous to those of the salts of carbonic acid. I believe this analogy has not heretofore been broached;—thus the results obtained, many of which are new, will enable chemists to decide whether there is sufficient ground to retain the relationship. Carbon has been found in many respects similar to sulphur, and why should not the analogy be borne out with the previously named acids, whose atomic constitution is so much alike. My friend and former teacher, Professor Graham, has added greatly to the science by instituting such analogies, and I am sure there remains still a wide field open for their extension.

The action of sulphurous acid upon many of the metals engaged the attention of Berthollet, Fourcroy, and Vauquelin; and from the results of the two latter-named chemists more particularly was drawn the conclusion, that when this acid is allowed to act upon a metal for some time, two salts are generated—a sulphite and a hyposulphite. Latterly MM. Fordos and Gelis have studied the action of sulphuric acid upon zinc, iron, tin, nickel, cadmium, potassium, and sodium.* They found that potassium (or sodium), when thrown into an aqueous solution of this gas, behaved in a similar manner to its being immersed in pure water—generating hydrogen gas, and the sulphurous acid uniting with the alkali produced. Zinc furnished them similar results to those obtained by Fourcroy and Vauquelin, who had not, however, analysed the products. They found that iron dissolved with great avidity in this acid, and gave crystals of sulphite. Nickel gave a sulphite and a hyposulphite. Thus far their results accorded with the hypotheses promulgated by Vauquelin and Fourcroy; but on proceeding with their researches, they found that when this acid was poured over cadmium or tin, *no hydrogen* was eliminated, but a sulphite and sulphuret formed. The subjoined represent the formulæ of the salts they analysed:—

Sulphite of zinc	$2n\,O\,.\,SO_2 + 2\,HO$
Sulphite of iron	$Fe\,O\,.\,SO_2 + 3\,HO$
Sulphite of nickel	$Ni\,O\,.\,SO_2 + 6\,HO$
Sulphite of cadmium	$Cd\,O\,.\,SO_2 + 2\,HO$

The preceding remarks I have deduced from their very valuable paper, as they coincide in some measure with a few of my own results, as will be hereafter shown. Dr. Vogel, sen., of Munich, has published† some very interesting experiments upon the action of sulphurous acid upon the metallic oxides; he found that red oxide of mercury, when treated with this acid, passes first to the state of suboxide in combination with sulphurous and sulphuric acids, and is by the continued action of the gas readily reduced to the metallic state. Oxide of silver is not completely reduced; the oxides of zinc, antimony, and uranium, do not undergo the slightest reduction. Calcined peroxide of iron does not yield any of its oxygen to this acid, but the calcined black oxide of copper is converted into the red suboxide. Dr. Vogel

* *Comptes Rendus*, No. 19, May 15, 1843.

† *Journal de Pharmacie*, Sept. and Oct. 1843.

also gives the action of this acid upon various salts, which will be found in his treatise upon the subject. M. P. Berthier published some time since an ingenious paper on some separations effected by means of sulphurous acid on the alkaline sulphites, part of which I shall refer to in describing the sulphite of alumina, &c. As the previously mentioned investigations are the most recent and satisfactory, and also in many respects closely allied to some of my own observations, I have inserted them for the inspection of those who may interest themselves in the research.

I shall now proceed to describe the various salts that I have procured, and also the analogy which they bear to the carbonates. I obtained the sulphurous acid by heating together in a flask sulphuric acid and metallic copper.

SALTS OF POTASH.

Sulphite of Potash.—I conducted a stream of sulphurous acid gas through a dilute solution of carbonate of potash, until all the carbonic acid was eliminated, and then placed the menstruum under a bell jar over sulphuric acid. For days afterwards I obtained large crystals (which were examined under a very fine microscope belonging to my friend Dr. Blyth), in the form of oblique rhombic octohedrons. They were very soluble in water, and but sparingly so in alcohol; strongly alkaline to test paper; possessed an acrid, bitterish taste, and slightly diliquesced on exposure to the air. When the crystals were slightly heated, vesiculation ensued; but as the temperature augmented sulphurous acid was expelled, and the residuum consisted principally of sulphate of potash mixed with sulphuret of potassium, and probably a little free alkali, as may be represented by the annexed equation.

$$5\,(KO\,.\,SO_2)\text{ yielding }SO_2 + 3\,(KO\,.\,SO_3) + KO + KS.$$

This sulphite, dried between folds of bibulous paper under an hydraulic press, gave the following analysis:—

3·7·095 grm. salt, treated with fuming nitric acid and nitrate of barytes, gave:
4·42 grm. sulphate of barytes; and
2·35 grm. salt, gave:
2·12 grm. sulphate of potash.

These numerical results give the subsequent per cents.:—

		Theory.
1 eq. sulphurous acid	32·75	32·946
1 eq. potash	48·51	48·557
2 eq. water or loss	18·74	18·497
	100·00	100·000

The preceding numerical results agree with the formula $KO\,.\,SO_2 + 2HO$, so that this salt is both analogous and isomorphous with the carbonate of potash, the composition of which is expressed by the formula $KO\,.\,CO_2 + 2HO$.

BISULPHITE OF POTASH.

This compound, which is mentioned by Berzelius,* I obtained by over-saturating a pretty strong solution of carbonate of potash, and then adding absolute alcohol. A white needle-like mass resulted, which was collected on a filter, and edulcorated with more of the precipitant. This salt, when kept on the tongue for some time, imparts a disagreeable sulphurous taste. It is neutral to test paper, and when exposed to the air for some time evolves sulphurous acid.

I procured this bisulphite also in beautiful crystals by allowing some of the over-saturated solution to repose in a corked flask for five weeks. The crystals were fine rhombic prisms.

Analysis of this Salt.

I.

2·298 grm. salt, treated with chlorine and nitrate of barytes, gave:
4·419 grm. sulphate of barytes; and
3·511 grm. salt gave:
2·5603 grm. sulphate of potash.

II.

2·398 grm. salt, treated with nitric acid, &c. gave
4·614 grm. sulphate of barytes.

* *Lehrbuch der Chemie*, vol. IV., p. 81.

Composition in per Cents.

	Found. I.	Found. II.	Theory.
2 eq. sulphurous acid	52·82	52·97	53·28
1 eq. potash	39·30	——	39·26
1 eq. water (or loss)	7·88	——	7·46
	100·00		100·00

Anhydrous Bisulphate of Potash.

I obtained this salt by transmitting a stream of sulphurous acid through a warm concentrated solution of carbonate of potash until effervescence ceased, and the menstruum had assumed a greenish yellow colour (did not contain free sulphur or a hyposulphite). This compound was deposited in hard, granular crystals, which I collected on a filter, affused with a small quantity of alcohol, and dried repeatedly between folds of bibulous paper. It was tardily dissolved by water, insoluble in ether, and very sparingly soluble in alcohol. Acid to test paper, and possessed a saline and not unpleasing taste. On exposure to the air no sulphurous acid exhaled; but, when heated in a dry tube, quantities of sulphurous acid and sulphur were expelled, the decomposition being represented by the annexed equation.

$2\,(KO\,.\,2\,SO_2)$ giving SO_2, S and $2\,(KO\,.\,SO_3)$.

Analyses of this Salt.

I.

2·110 grm. salt treated with fuming nitric acid, and precipitated by nitrate of barytes, gave:
4·420 grm. sulphate of barytes; and
2·805 grm. salt gave:
2·178 grm. sulphate of potash.

II.

1·440 grm. salt treated with nitric acid, &c., gave:
·827 grm. sulphate of barytes; and
4·233 grm. salt, &c., gave:
3·210 grm. sulphate of potash.

III.

1·973 grm. salt, heated to redness, gave:
1·542 grm. sulphate of potash.

The salt, therefore, on being heated to redness, lost 431 SO_2 and S = 21·89 p. c. Calculated loss, 21·63.

Contents of the preceding Analyses reduced to per Cents.

	I.	II.	III.	Mean.	Theory.
2 eq. sulphurous acid	57·57	57·43	——	57·605	57·60
1 eq. potash	41·99	41·00	42·27	41·789	42·40
Loss	·00·44	1·57	——	·615	——
	100·00	100·00		100·000	100·00

The constitution of the above salt is very singular, as it contains two atoms of sulphurous acid united with one atom of potash, and *no* atomically combined water (as was ascertained by ignition).

This salt has not hitherto been mentioned; it is not analogous to any compounds yet known, except the bichromate of potash and anhydrous bisulphate of Jacquelain. I subjoin the three formulæ.

$$KO\,.\,Cr\,O_3 + Cr\,O_3 \text{ or } KO\,.\,Cr_2\,O_6$$
$$KO\,.\,SO_3 + SO_3 \text{ or } KO\,.\,S_2\,O_6$$
$$KO\,.\,SO_2 + SO_2 \text{ or } KO\,.\,S_2\,O_4$$

When recently in England, I mentioned to my esteemed friend, *Professor Graham*, that I had obtained such a compound, and he was of opinion that it might prove an acquisition to his theory on the constitution of the various salts. According to *Graham*, by doubling the atom in such salts they cease to be anomalous, being then represented as neutral compounds containing one atom of acid to one of base. *Pelouze* obtained a salt by passing nitric oxide gas through a solution of sulphite of potash,* which may be represented by the formula $KO\,.\,SO_2 + NO_2$. Now, if this view be assumed, the second atom of sulphurous acid in the anhydrous bisulphite, according to the law of substitution, is replaced by an atom of nitric oxide, as may be readily represented by the subsequent classification of the two formulæ.

$$KO\,.\,SO_2 + SO_2$$
$$KO\,.\,SO_2 + NO_2$$

* *Ann. Chim. Phys.*, 60, 160.

I obtained another acid salt of potash, but owing to its parting with such a large proportion of sulphurous acid, even when kept in a well-stoppered bottle, I was not enabled to arrive at a satisfactory conclusion as to its constitution. It may, however, be a sesquisulphite, and have its atoms arranged according to the annexed formula.

$$2\,(KO\,.\,SO_2) + HO\,.\,SO_2$$

SALTS OF SODA.

Sulphite of Soda.—This salt is obtained by transmitting sulphurous acid through a solution of carbonate of soda until the liquid reddens vegetable blues, and allowing the solution to repose for some days under a bell jar over sulphuric acid. I procured the salt in large oblique prisms, which, on exposure to the air for some time, efflorcseed, and a white amorphous sulphate and sulphite remained. It is rather less soluble in water than the carbonate, and reacts feebly alkaline. Its taste is cooling and sulphurcous. When strongly heated, it undergoes the aqueous fusion accompanied with a powerful tumefaction, and its water and part of the acid is dissipated. I believe this sulphite has not been analysed since the time of Vauquelin, who obtained it with eight atoms of water, according with the formula $Na\,O.\,SO_2 + 8\,HO$. I am inclined to think that this salt, with a few precautions, might be found at different temperatures with various proportions of water similar to the carbonate.

This sulphate, dried between folds of bibulous paper, gave the following results:—

I.

2·98 grm. salt, treated with fuming nitric acid and nitrate of barytes, gave:
2·22 grm. sulphate of barytes.
4·81 grm. salt, treated with hydrochloric acid, gave:
2·68 grm. chloride of sodium = ·970 soda.

II.

3·74 grm. salt, treated with chlorine and nitrate of barytes, gave:
3·12 grm. sulphate of barytes.

As I made two determinations of sulphurous acid in this salt, I calculated the water as loss.

The above analyses, &c., are expressed in the following per cents.:—

Composition in per Cents.

	Theory.	Found.	
1 eq. sulphurous acid	401·2	20·90	20·47 20·24
1 eq. soda	390·90	20·41	20·16 ——
10 eq. water	112·5	58·69	59·37 ——
	1917·10	100·00	100·00

This salt is similarly constituted to the carbonate of soda of commerce, and the composition of the two may be represented according to the annexed formulæ:—

$$Na\,O\,.\,SO_2 + 10\,HO$$
$$Na\,O\,.\,CO_2 + 10\,HO$$

Bisulphite of Soda.—Guy Lussac and Welter have given a short description of this salt. They say it is obtained by saturating carbonate of soda with sulphurous acid; crystallizable; does not redden litmus paper.

I obtained it in a similar manner in opaque crystals, but could not determine their form. It is precipitated in a granular state by alcohol, from an over-saturated solution of sulphurous acid and soda. It is rather less soluble in water than the bicarbonate. Acid to test paper, and possesses a disagreeable and somewhat sulphureous taste. When exposed to the air for some time, it evolves sulphurous acid. If heated, it decrepitates; gives off water, sulphurous acid, and sulphur, as may be expressed by the annexed equation:—

$$2\,(Na\,O\,2\,SO_2) + 2\,HO \text{ give } 2\,HO\,.\,SO_2\,S + 2\,(Na\,O\,.\,SO_3)$$

Analyses of this Salt.

I.

1·010 grm. dried salt, treated with nitric acid, &c., gave:
2·215 grm. sulphate of barytes; and
1·670 grm. salt gave:
1·105 grm. sulphate of soda.

II.

1·898 grm. salt, treated with nitric acid, &c., gave: 4·201 grm. sulphate of barytes.

Calculation in per Cents.

	Theory.	Found.
2 eq. sulphurous acid	61·42	60·20 and 60·85
1 eq. soda	29·96	29·04
1 eq. water (loss)	8·62	10·76
	100·00	100·00

This salt also corresponds with the bicarbonate of Graham, as will be seen by a comparison of the subjoined formulæ:—

$Na\,O\,.\,SO_2 + HO\,SO_2$ or $Na\,O\,.\,2\,SO_2 + HO$
$Na\,O\,.\,CO_2 + HO\,CO_2$ or $Na\,O\,.\,2\,CO_2 + HO$

Clark obtained a bisulphite of soda containing nine atoms of water = Na O, SO_2, HO, SO_2 + 8 HO, which agrees in constitution with the following symbolic carbonate:—

$$Na\,O\,.\,CO_2\,.HO\,.\,CO_2 + 8\,HO$$

In analyses of sulphites of soda or potash, when determining the base as sulphate, it is necessary to place a piece of dry carbonate of ammonia in the crucible when heated nearly to redness, and, after doing so, to heat more strongly. The excess of sulphuric acid is expelled in combination with ammonia, and neutral salts remain behind.

When the soda or potash is estimated as chloride, the only precaution to be observed is, that the chloride formed be not heated above incipient redness, otherwise small portions of the salt may volatilize.

SALTS OF AMMONIA.

I was a long time before I could obtain any of the ammoniacal sulphites. The compounds I procured from aqueous solutions were so exceedingly deliquescent as to be totally unfit for analysis. When I mentioned to Professor Liebig that I was not at all successful in procuring these compounds, he recommended me to resort to alcohol and ether, which suggestion was willingly followed, and proved of essential service, as will be perceived in the description of the salts. The ammonia in the sulphites was determined by forming the double salt of chloride of platinum and ammonium, and edulcorating this compound with a mixture of alcohol and ether. It is decidedly the best and most accurate method.

Sulphite of Ammonia.—I transmitted *moist* sulphurous acid and ammoniacal gases through absolute alcohol for about ten minutes, when the whole menstruum became filled with brilliant white satiny crystals. I allowed the whole to repose for two days, filtered and then dried the salt between folds of bibulous paper. It was strongly alkaline, possessed a disagreeable and somewhat caustic taste, and dissolved tardily in water. The following is the analysis of this salt, which was performed immediately after the sulphite was dried, so as to avoid the possibility of an appreciable decomposition ensuing:—

Analysis of this Salt.

1·274 grm. salt, treated with fuming nitric acid and nitrate of barytes, gave:
2·1875 grm. sulphate of barytes.
2·002 grm. salt, treated with hydrochloric acid and chloride of platinum, gave:
6·44 grm. chloride of platinum and ammonium.
The water I took as loss.

The above numerical results accord with the following:—

Calculation in per Cents.

		Theory.	Found.
1 atom sulphurous acid	401·2	47·754	47·200
1 atom ammonia	213·2	25·439	24·83
2 atoms water	225·0	26·808	27·97
	839·4	100·000	100·00

These numbers corresponded with the formula—

$NH^3\,SO_2 + 2\,HO$ or $NH^4\,.O\,SO_2 + HO$

This salt, which is *strongly alkaline*, I distilled in a small retort. Water passed over first; as the temperature augmented, large quantities of ammonia were disengaged, and, when the temperature was still elevated, a beautiful silky sublimate collected in the beak of the retort, which was *neutral* to litmus paper. The whole of the salt sublimed by this treatment. In this decomposition not a trace of sulphuric acid is produced, which was ascertained by the precipitate given with chloride of barium being entirely soluble in hydrochloric acid. The sublimate was soluble in alcohol, and, when exposed for some time to the air, eliminated sulphurous acid, similar to the salt which I shall next describe. By referring to the subjoined equation this decomposition is explained:—

$2\,(NH^4\,O\,.\,SO_2) + 4\,HO$ giving $3\,HO + NH^3 + (NH^4\,O\,.\,2SO_2)$

I was not fortunate in obtaining an acid salt in alcohol, for the bisulphate is very soluble in this fluid, and, therefore, cannot readily be perceived in sufficient quantities for analysis.

Bisulphite of Ammonia.—This salt deposits in a gritty state when ether is impregnated with moist sulphurous acid and ammoniacal gases. It is neutral to test paper, and, when exposed to the air for a short time, evolves large quantities of sulphurous acid. When left in the air for nine days it had lost nearly all its sulphurous acid, and the residuum consisted principally of sulphate of ammonia. On being heated in a tube, and water deposited in the upper part, sulphurous acid escaped, and a beautiful salt condensed on the sides, which is probably constituted according to the annexed formula.

$$2\,(NH^3\,.\,SO_2) + HO$$

and the decomposition may be expressed by the following equation:—

$2\,(NH^4\,O\,.\,2\,SO_2)$ resolved into $HO + 2\,SO_2 + 2\,(NH^3\,.\,SO_2) + HO$

It is soluble in water and alcohol, and possesses a cooling and saline taste. The subjoined is the analysis of this salt well dried between folds of bibulous paper.

2·103 grm. salt, treated with fuming nitric acid, &c., gave:
5·432 grm. sulphate of barytes.
2·282 grm. salt, treated with hydrochloric acid and chloride of plat., gave:
5·3982 grm. chloride of platinum and ammonium.

The following is the above result (with the water calculated as loss) at per cents.:—

Composition in per Cents.

	Theory.	Found.
2 eq. sulphurous acid	71·074	70·993
1 eq. ammonia	18·963	18·159
1 eq. water	9·963	10·848
	100·000	100·000

If the water in this sulphite be associated with the ammonia, thus constituting oxide of ammonium, its constitution will be analogous to the anhydrous bisulphite of potash. I shall append the formulæ of the two salts:—

$NH_4\,O\,.\,SO_2 + SO_2$ or $NH^4\,O\,.\,S_2\,O_4$
$KO\,.\,SO_2 + SO_2$ or $KO\,.\,S_2\,O_4$

Or the sulphurous acid may be said to replace the second atom of water in the first described sulphite of ammonia as is shewn below.

$NH^4\,O\,.\,SO_2 + HO$
$NH^4\,O\,.\,SO_2 + SO_2$

The sulphurous acid or the water in the above salts may be replaced by sulphite of magnesia forming a double salt, which is mentioned by Berzelius.*

I passed *dry* sulphurous acid and ammoniacal gases through ether, and, what is rather remarkable, obtained a salt which gave numbers corresponding to the ones in the preceding analysis. The ammonia in this salt was determined by my kind friend, Dr. A. W. Hofmann.

Analysis of the Salt.

1·971 grm. salt gave:
2·093 grm. platinum; and
1·377 grm. salt, treated with nitric acid, &c. gave:
3·497 grm. sulphate of barytes = 0·962 grm. sulphurous acid.

* *Lehrbuch der Chemie*, vol. IV., p. 303.

Composition in per Cents.

	Found.	Theory.
2 eq. sulphurous acid	69·87	71·074
1 eq. ammonia	18·46	18·963
1 eq. water or loss	11·67	9·963
	100·00	100·000

The salt did contain water, for when heated strongly in a dry tube, a portion of aqueous vapor condensed in the upper part. The sulphites of ammonia I believe could be made as numerous as the carbonates of *Rose*, if an entire investigation was devoted to them.

I was anxious to ascertain what would be the resulting salt when carbonic and ammoniacal gases were passed into absolute alcohol. I therefore performed the experiment, and obtained a stable carbonate of ammonia, which gave the following results:—

0·428 grm. salt, analysed by Will and Fresenius's method, gave:
0·212 grm. carbonic acid; and
0·553 grm. salt gave:
2·800 grm. chloride of platinum and ammonium = ·215 NH^3.

When I showed the above numbers to Professor Liebig, he said that they corresponded with a salt obtained by Rose, the formula of which is $2\,(NH^3\,.\,CO_2) + HO$. I append my results in per cents., together with the numbers of Rose.

Composition in per Cents.

		Theory.	Rose.	Found.
2 atoms carbonic acid	550·00	50.58	50·09	49·53
2 atoms ammonia	426·40	39·08	39·27	38·70
1 atom water	112·50	10·34	10·64	11·77
	1088·90	100·00	100·00	100·00

The anhydrous bisulphite of ammonia $NH^3\,.\,2SO_2$ and the carbonates investigated by Rose, will be found in Gmelin's Chemistry, vol. II., pp. 840, &c., and p. 865.

SULPHITE OF BARYTES.

I added sulphite of soda to nitrate of barytes, and obtained a white, tasteless precipitate, which dissolved with difficulty when suspended in water, and treated for some time with a current of sulphurous acid gas. This salt deposits from the menstruum in hard diaphonous needles, which are very persistent in air. When the crystals are slightly heated they decrepitate, and, as the temperature rises, a small quantity of water is given off, and portions of sulphurous acid and sulphur are also expelled.

Analysis of this Salt.

2·353 grm. salt gave:
2·463 grm. sulphate of barytes = ·678 SO_2 and 1·617 barytes.

This salt has been examined by Berzelius; therefore I shall annex his analysis of it, also the above reduced to per cents.

		Berzelius.	Found.	Theory.
1 eq. sulphurous acid	401·17	28 84	28·81	29·53
1 eq. barytes	956·88	69·74	68·73	70·47
Water, or loss		1·42	2·46	
	1358·05	100·00	100·00	100·00

This salt may be obtained in six-sided prisms when the sulphurous acid solution is slightly heated, and then allowed to repose for some days. The water it contains is mechanically lodged between the layers of the crystals, as is also the case with the chloride of sodium.

The sulphite of barytes Ba O . SO_2, corresponds with the neutral carbonate, Ba O · CO_2.

[To be continued.]

To Prepare Pure Precipitated Chalk:—
Take of White marble, 1 part.
Pure hydrochloric acid, 2¼ parts.
Carbonate of soda (crystals), 3 parts.
Water, a sufficient quantity.
Dissolve the marble in the hydrochloric acid, previously mixed with two parts of water, and dilute the solution with four parts more of water. Dissolve the carbonate of soda in twelve parts of water. Mix the solutions, and collect, wash, and dry the precipitate.

ORGANIC CHEMISRY.

PLAYFAIR ON THE FUNCTIONS OF OXYGEN IN THE PRODUCTION OF SLEEP AND ITS CONCOMITANT PHENOMENA.—The researches of Liebig have lately shown that much information may be obtained regarding the processes of life in the animal economy, even when these cannot be subjected to direct experiment. Thus he has thrown considerable light on the phenomena of motion, by applying to their elucidation chemical laws, which analogy led him to expect would come into operation during the exhibition of these phenomena. But there are many other processes to which he has not devoted attention, but which seem to be explicable on the principles which he has so ably established. One of these—the subject of sleep—is of great importance in its relations to medical practice, and yet very little is known of its cause, or of the chemical state of the body during its occurrence. Park, in his able memoir "On the Causes of Sleep and Dreaming," has pointed out the errors of those physiologists who preceded him in investigations on this subject; but he has not succeeded in doing more than establishing that certain physiological states of the body offer inducements to sleep, without showing in what manner these contribute to the production of a quiescent state of the mind. He considers that the true causes of sleep are, the periodical diminution in the action of the heart, and simultaneous relaxation of the vessels of the brain, by which a slower though fuller circulation of blood through the brain is effected. But this merely describes a physiological state of the body, without showing in what manner that state favours the quiescence of the mind. It therefore does not furnish an explanation of sleep, but merely points out the condition of the body which induces the repose of the mind. A more accurate definition is therefore desirable, in order that we may fully understand the circumstances which predispose to sleep, or occasion wakefulness.

I shall attempt in this paper to show what chemistry seems to point out as the probable cause of sleep, and of its concomitant phenomena, more with the object of drawing attention to the subject than with a view to insist on the perfect accuracy of the chemical definition. Chemists are too apt to fall into the sad error of converting the animal body into a laboratory; and therefore it is the duty of the physiologist to watch their steps narrowly, and prevent the evils which may arise from this error. On this account I wish the views here given to be looked on with suspicion, and only accredited so far as they stand in unison with the acknowledged experience of medical practice.

The production of animal heat, according to the chemical view of the subject, is due to the union of oxygen with certain constituents of food, or with the tissues already formed. The carnivora depend wholly on the waste of the muscular tissues for the maintenance of the heat of their bodies, for the flesh on which they subsist is destitute of the unazotised organic constituents which are employed in supporting the proper temperature of the herbivora. Liebig has gone far to prove that the oxidation, or waste of tissues in the carnivora, takes place only where the vital powers are employed in the execution of a movement required by the will—at a time, therefore, when they are not engaged in resisting the encroachments of chemical affinity, represented in the body by the oxygen contained in arterial blood. He has also shown that the waste of the muscular tissues of the herbivora is effected under similar conditions. According to this theory, there cannot be a movement in the body without a corresponding waste (oxygenation) of matter in the organ subjected to motion. The circulation of blood in the body, and the constant conversion of venous into arterial blood, afford an abundant supply of oxygen to replace that expelled from the system in the excretions.

Whilst the animal receives a quantity of food sufficient to restore the matter carried off by oxygen, there are exhibited no peculiar phenomena. But when it is deprived of food, as in the case of starvation, the changes of matter which occur in the system are very characteristic and worthy of attention. As the oxygen of the blood does not now meet food, with which to unite, it seizes upon the vital tissues themselves, and effects their destruction. The sufferer now becomes rapidly emaciated, and the urine is observed to contain an excessive quantity of the products which result from a waste of the tissues. After this emaciation has proceeded for some time, the substance of the brain begins to yield to the destructive action, and, according to the rapidity of its waste, excited action or delirious paroxysms ensue. Then the heart becomes enfeebled, the blood flows less quickly than it did before, the delirium subsides, and the patient dies from exhaustion. The phenomena observed in fever, and produced, according to chemists, by the entrance into the body of a substance already in a state of oxidation, either as a specific contagion, or as malarious matter, are precisely of a similar character. The point in its progress, bearing upon our present subject, is the increase of force in the involuntary organs, which in time passes over to the voluntary organs, and to the brain, producing as in the former case delirious paroxysms.

The great distinction between animal and vegetable life is volition: vegetables, not being possessed of volition, are constantly engaged in increasing their fabric; and, therefore, when volition ceases in the animal, it is aptly said to have a *vegetative* life, for the vital powers are wholly employed in increasing the mass of the body. Sleep is the time when an animal becomes assimilated to a vegetable. Physiologists have shown that the two most marked points during sleep are diminished respiration and decreased circulation. They are agreed that, towards the evening, or at the lapse of a certain number of hours of work, the involuntary organs, the heart and lungs, lose their wonted activity, and suffer a periodical diminution of action. Blumenbach describes the case of a patient trepanned, in whom the brain was observed to sink during sleep and enlarge on waking, obviously arising from the circulation being diminished in the former state and increased in the latter. The consequence of this diminution is, that less oxygen is taken into the system. Hence the proportion of venous blood is increased, and the waste caused by arterial blood diminished. The skull being a close cavity, must contain a larger proportion of venous, if there be a diminution of arterial blood in the body. It is the latter alone which can cause the waste of the brain, for venous blood has already parted with its oxygen to materials met with in its course.

Matter in a state of inertia can never manifest the existence of a power. Its motion alone shows that some power is in operation. If the portion of matter used as the organ of manifestation be placed in such a condition as to render that manifestation impossible, there is no evidence to the external world that power was exerted. It has been perfectly demonstrated, that every manifestation of power in the voluntary organs is accompanied by a change in the matter of which they consist. The changed matter being now unfit for vital structures is separated from the body. Müller and all other eminent physiologists are of opinion that the same change takes place in the brain, the organ of the mind. In fact, the contrary opinion involves such violation of analogy, that its adoption, unless founded on the strongest grounds, is inadmissible. We look upon a spot attentively; it gradually waxes dimmer, until it finally disappears. We think upon a particular subject; in time our thoughts are less clear, soon they become strangely confused, and we are obliged to give up the attempt at concentration, by thinking on a subject quite different from that which first engaged our thoughts. This of course implies that the organs of manifestation have become in part destroyed, and that the mind cannot manifest itself to the world until the impaired organs have attained their proper integrity; for it cannot be conceived that the mind, disconnected with matter, could suffer exhaustion. This involves, it is true, the idea that different parts of the brain are employed in different manifestations, but we know that as far as sensation and intellect are concerned this is the case, and probability indicates a still more minute division. If, therefore, the brain suffer changes, as do the other organs of the body by their exercise, there is as much necessity for repose in the action of the brain, as there is for a vegetative state of existence to reinstate in their full integrity the organs of volition. Hence the necessity for that quiescent state of the mind known as sleep, when its manifestations cease. The waste of cerebral substance could only have been occasioned by oxygen, which is the only ultimate cause of waste, as far as we are aware, in the animal economy. A deficiency in its supply would therefore retard waste, and allow vitality to remodel its impaired structures.

Such, then, is the state into which the body is thrown by the periodical diminution in the action of the heart and lungs. The less rapidly that the heart beats, the less rapidly can the blood be aërated, and the oxygen-bearing fluid can be supplied to the brain. The slower that the lungs act, the slower must oxygen enter the system to supply the diminished circulation. And as the brain in sleep is not in a state in which it can change, from a deficiency in the supply of oxygen, the consequence is (if it be admitted that the manifestation of thought and sensation is accompanied by changes in the material substance of the brain), that the manifestations of the mind are prevented, and it becomes no longer apparent to the external world.

This, then, is SLEEP. But if the theory be correct, it must be able to explain the various circumstances which occasion or act as predisposing causes to the production of this state, and if it fail in the explanation of any of these, then is the theory imperfect; but if it explain more of them than the other theories usually received, such as those of Cullen, Blumenbach, Park, and others, it deserves to be considered as a nearer approximation to the truth, and the cases which it fails to comprehend may be included as our knowledge advances.

The first point demanding consideration is, how it happens that a recumbent posture is favourable to sleep. Park justly ascribes this to the diminished pressure of the blood on the heart. The weight of the column of blood from the head to the heart, estimated by Hales as equal in force to five pounds, is removed, and thus its distending force is diminished. The heart now relaxes, and the blood therefore is sent less slowly through the system. Having, by the horizontal posture assumed, acquired a retarded flow, the blood now comes less rapidly in contact with the organs of respiration, on which the same posture has produced a diminished action, and thus the quantity of arterial blood in the body becomes diminished. Though, therefore, all the vessels in the brain remain as full as they did before, yet, by the deficient supply of oxygen, or, in other words, of arterial blood, and by the retarded circulation of that which does exist in the cavity of the skull, the causes of waste are diminished, and therefore, according to the theory, sleep is produced. For the same reason, sleep ensues when the aorta of an animal is tied, or when arterial blood is removed in large quantity from the body by excessive bleeding. Bichat has shown that when venous blood is withdrawn from a vein and projected into an artery, sleep ensues, amounting to asphyxia, or even to death. The later researches of Dr. Kay, now Dr. Kay Shuttleworth, have proved that part of the results obtained by Bichat might have been due to an increased pressure on the brain; but Dr. Kay's observations, while they modify, do not set aside the experiments of the former physiologist.

Anything which removes the oxygen from the blood will in the same manner cause sleep. This is particularly apparent in the debauch of a drunkard. The drunkard takes alcoholic liquors with the production of two opposite effects. At first his heart beats rapidly; the blood flows more quickly, and he enters into that stage of fever which I described at the outset of the paper, in which the rapidity of circulation causes such an enormous supply of oxygen to the brain, that its substance wastes so rapidly as to become unfitted for the seat of the intellect, and delirium ensues. But even while this delirium is at its height, the vapour of the alcohol is penetrating by diffusion every part of his body. Its hydrogen and its car-

bon are converting arterial blood into venous by depriving the former of oxygen, which is its essential characteristic. The delirium now subsides; but the alcohol carries on its work of depriving the blood of oxygen, and the latter, now not reaching the brain in quantity as it did before, prevents change in its substance, and the drunkard falls down in deep stupor or sleep. To restore him from this state, we withdraw the combustible fluid from the stomach by means of the stomach-pump, and by ammonia and other stimulants endeavour to excite respiration and circulation, in order that the alcohol may be more speedily consumed.

The action of alcohol differs from that of opium or narcotics, because the permanent effect of the latter, whatever the first transitory effect may be, is to diminish the action of the heart and lungs, and therefore the sleep thus occasioned is brought about by causes exactly similar to those which in the natural state of health produce ordinary sleep.

The tendency to sleep in different animals is in proportion to the amount of oxygen consumed by them, and to the amount of carbonic acid produced. Thus reptiles and the naked amphibia produce, relative to their weight, according to the experiments of Müller, one-tenth the amount of carbonic acid evolved by mammalia, and one-nineteenth that of birds. We have no numbers to express the tendency to sleep of these animals, but it is known that reptiles are peculiarly liable to be in a state of torpor or sleep, while birds are, on the contrary, wakeful animals. A reptile, such as a frog, will exist in a state of torpor for twelve hours in an atmosphere of pure hydrogen gas, while birds die in the same number of seconds with the ordinary symptoms of asphyxia. Hydrogen gas, when respired with air, gives a tendency to sleep, as shown by the experiments of Allan and Pepys, probably owing to the conversion of arterial into venous blood, as in the case of alcohol. The same circumstance of a diminished supply of oxygen to the blood, which induces sleep in reptiles, acts also in different mammalia in the promotion of this state, according to the relative size of their lungs. The same circumstance seems to operate in a like way with different men.

The only explanation which I have seen of the tendency to sleep after a heavy and excessive dinner is that first promulgated, I believe, by Macnish, who ascribes it to the drafting away of a large amount of sensorial or nervous power from the brain to complete the digestion of the excess of food in the stomach. This implies the necessity for considering the first act of digestion as an act of vitality, of which, to say the least, there are great doubts. But the drafting of sensorial power, that is, as I take it, of power connected with the operation of the mind—for, if not, its removal could not favour the quiescence of the latter—is a mode of explanation which must be considered entirely hypothetical. I am not aware that an inducement to sleep is in general experienced when a small quantity of an indigestible food is taken into the stomach, and yet this ought to be the case according to the view of Macnish. The tendency to sleep is occasioned when the stomach is too much distended by an excess of food (or if it do occur with a small quantity of an indigestible aliment, then there is an excessive flow of arterial blood to the stomach, to assist in the more rapid oxidation of its coat, which the German chemists have dignified as the formation of a peculiar substance termed pepsin). The consequence of this distention is, that the diaphragm which separates the intestines from the heart and lungs is pushed upwards against the latter, encroaching upon the space which ought to be occupied by them, thus preventing their free play, or, in other words, depriving the blood of its proper supply of oxygen, and therefore producing sleep. A person subject to sleep after dinner experiences a sensation of cold, obviously arising from the diminished oxidation in his body. If this cold continue, sleep is prevented, because it excites—as cold generally does—the respiratory organs to greater activity, and this activity acts as an antagonist to sleep, or, in fact, neutralizes the effects arising from the pressure of the diaphragm against the lungs. Hence it is that such persons draw their seats towards the fire. The warmth of the fire prevents the increased action of the lungs, by preventing a diminution in the temperature of the body, and therefore the lungs are not excited to increased action, and sleep ensues. Hence, also, a gentle walk after dinner removes the tendency by accelerating the play of the lungs, which now, by their increased action, introduce sufficient oxygen into the system to prevent sleep. It is also possible, as has been suggested to me by Mr. Noble, that the increased flow of arterial blood to the stomach after a heavy meal may cause a tendency to sleep by withdrawing a corresponding quantity from the brain. The effect occasioned by the pressure of the diaphragm on the lungs, until the distention has ceased, is analogous to the more permanent effects produced in very fat individuals. It is well known that very fat people are peculiarly prone to sleep. The fat accumulates around the viscera, pushes up the diaphragm, and lodging around the heart and edges of the lungs; the latter by all these causes are compelled to play in smaller space, and soon become permanently contracted. Hence, any cause which occasions diminished respiration in such an individual will cause him to fall asleep, by diminishing further the supply of oxygen to the system. The mere diminution in the action of the lungs, produced by sitting, often occasions sleep in such persons. In their case, the further protrusion of the diaphragm after meals almost invariably produces sleep. This is more marked in animals fattened for the butcher. Pigs in the last stage of fattening exhibit this disposition in a marked manner. After distending their stomachs with food, they give a few ineffectual attempts at an active respiration, and fall into deep sleep. The cause is the same as that first stated, namely, the pressure of the diaphragm against the lungs; this prevents a proper supply of oxygen from entering the system. Macnish was not wrong in his observation that the sensorial power became diminished in the brain after a heavy dinner; but he mistook the effect for the cause when he attributed the tendency to sleep to the abstraction of this power. The diminution of the quantity of arterial blood in the cavity of the skull appears to be the true cause of sleep in this case; and the decrease of sensorial power is a consequence, but not the cause, of the sleep. It cannot be considered that the absence of a disposition to sleep in some kinds of dropsy, in which the diaphragm is pushed against the lungs, forms a decided objection to the view given of the tendency to sleep after dinner, because the contraction of the lungs being gradual, nature suits itself to the circumstances by exciting a more rapid respiration. Besides, the results occurring in the diseased state ought not to be considered strictly parallel to those we would expect if the body were in health.

Perhaps I might venture to throw out this view as explanatory of the winter sleep of hybernating animals. In summer these animals accumulate fat in their bodies, probably from the very fact of the smallness of their lungs, which prevents the entrance of a sufficient supply of oxygen to convert the unazotized portion of their food into carbonic acid and water. This fat, accumulating around the caul and loins, pushes forward the diaphragm against the lungs. The fat also gathers round the edges of the heart and lungs, and still further diminishes the space in which the latter ought to play. Thus respiration is greatly retarded, in consequence of which the animal falls asleep. This explanation accords with the interesting experiments of Saissy, who has shown that hybernating animals decompose most air when they are in a state of greatest activity, that they respire less during autumn, as their fat accumulates, and that the respiration becomes extremely feeble at the commencement of their winter sleep, and ceases altogether when that sleep becomes profound. Spallanzani has confirmed this fact, showing that there must be a cutaneous respiration, for a small amount of carbonic acid is evolved, although the lungs cease to act. During the long-continued sleep of the hybernating animals, the lungs play slowly; in fact, several minutes often elapse between each respiration, and the diminished state of oxidation is proved by the reduced temperature of their bodies, which is generally not higher than four degrees above that of the surrounding medium. In this state they have been aptly compared to lamps slowly burning, their fat being the oil, and the lungs the wick of the lamp. It is true that cold is favourable to the production of hybernation, and this is not in opposition to the theory; but Berthold has shown that hybernation takes place in a warm as well as in a cold atmosphere. If our view be correct, very fat animals should show a similar disposition to sleep, and it is known that a pig in its last stage of fattening is rarely awake. Instances have occurred in which pigs, being placed in a favourable condition, have actually proved their capability of being in a state of hybernation. Thus Martell describes the case of a fat pig overwhelmed with a slip of earth, which lived 160 days without food, and was found to have diminished in weight in that time more than 120 lbs., an instance quite analogous to the state of hybernation.

It is well known that intense cold is a powerful inducement to sleep. This effect is partly mechanical. The vessels containing blood become contracted; the blood itself becomes more dense, and flows more sluggishly; and consequently the brain, from the operation of both these causes, is less freely supplied with arterial blood. The theory, therefore, explains the result. This is the case only with extreme cold, for a slightly reduced temperature, instead of promoting, often retards sleep. But here, also, the theory is true to itself, for slight cold is known to increase the rapidity of respiration, and therefore causes an increased supply of oxygen to the system. Slight cold cannot act in this way so easily in the case of hybernating animals as in others, because the accumulation of fat, and enlargement of the glands in the chest and neck, press upon the respiratory nerves, and prevent their proper action.

If, then, it be true, that before the mind can manifest itself to the external world, its organ, the brain, must be in the position to unite with oxygen, anything which tends to withdraw it from that position must cause an impairment of the faculties, even if the cause do not operate with sufficient intensity to produce sleep. This is very apparent in the cold stage of ague, when the blood circulates slowly through the body. In fever, on the other hand, when the blood rushes in a torrent through the system, the mind becomes acutely sensible to every perception. In fever, also, we find little disposition to sleep, and when this does occur, it is restless and disordered, accompanied by troubled dreams. The chemistry of this disease affords us an instructive lesson with regard to phenomena resulting in the case of health. There are two states into which organic matter passes—DECAY being the change which ensues when a large supply of oxygen is present; PUTREFACTION, when that supply is deficient. During the waking state in fever, decay or eremacausis proceeds rapidly, and delirium, the consequence of this state, appears when the heart beats quickly and the lungs play strongly; in other words, when the greatest supply of arterial blood is sent through the system. But during night, when the oxygen-bearing blood is decreased in quantity by diminished respiration—when oxygen is, therefore, not present in quantity sufficient to combine with the changing matter—then it passes over into putrefaction, indicated by the petechiæ which then appear. This chemical view of fever, either as exhibited in fevers of the typhoid type or those occurring in malignant forms of disease, is not unimportant. If the appearance of petechiæ during sleep be, as I suppose, an indication that the body has passed over from the chemical state of eremacausis to that of putrefaction, from a deficiency in the supply of oxygen, then the means for the prevention of these states are very different, and the practice in the treatment might be made to suit the periodicity of the return. I throw this out as a mere suggestion for further inquiry. But there are numerous points in support of this view. It is only in the absence of increased action that we observe the ammoniacal nature of the excretions, or the peculiar odour of the breath which indicates a state of change, the very reverse of that of eremacausis. In this state, even on the old system of treatment, bleeding was not resorted to, but, on the contrary, stimulants

were employed to cause increased circulation; for experience pointed out that the change thus begun is that which continues when vitality has left the body.

This case affords a clue not only to the explanation of chronic wakefulness, but also to wakefulness under ordinary circumstances. Some organic matter in a state of decay has entered the body, and has thrown the blood into a similar state of change. To prevent any dispute as to the kind of matter, let us take the case of sympathetic fever, or that of cynanche maligna. A patient enters the hospital with a fractured bone; the case goes on favourably,—nothing is at first observed but local irritation;—then it may assume a malignant form; pus, obviously by its odour in a state of change, is observed to collect;—then some of this is absorbed into the blood (for Gulliver states that he has found it there), and communicates to that fluid the same state of change;—then fever, called sympathetic, ensues; but if it be "sympathy," it sympathy exerted by one matter upon another, as a decaying orange excites decay in a fresh orange. This fever, be it observed, does not arise usually when an abscess is unbroken. It is generally excited when the pus has come in contact with air, and has united with oxygen. We try to prevent this union by means of poultices, these poultices being made of materials which will of themselves unite with oxygen, and thus prevent it acting on the pus. Occasionally poultices are used made of yeast and flour, as in the cataplasma fermenti of the London Pharmacopœia, the object being to surround the pus with an atmosphere of carbonic acid, and thus prevent the access of oxygen. The most favourite poultice in use is that made with linseed, which, from its oil and mucilage, possesses a powerful affinity for oxygen. The state of change, being once excited, goes on, and cannot be arrested without vigorous measures; sometimes not at all until death ensues, from the combined effects of decay and putrefaction following each other as the oxygen is sufficient or deficient. But the point to be observed is this, that the change in the blood once begun, is with difficulty arrested; the disposition to oxygenize is communicated, and if there be oxygen sufficient, matter will be oxidized. Then, to apply this to our subject, the brain becomes excited by intense thought, by the exercise of imagination, by exciting scenes of amusement, or by whatever cause it may be. The mind, being called into full exercise, must in its manifestations cause a change of matter in the organ in which it resides. But in this case the change of matter is excessive, and the tendency to oxidation is communicated to the part of the brain contiguous to that in a state of change. This also becomes oxidized, and the cerebral substance does not get into that state which favours the quiescent state of the mind known as sleep. The student, after severe and exciting study, is familiar with this state of wakefulness. If his studies have been such as to demand the exercise of his reason, on retiring to rest he endeavours to force his attention into subjects the reverse of the former, generally those of imagination. In other words, he endeavours to withdraw his mind from manifesting itself through that portion of matter which is thrown into a state of change, and by so doing it gradually resumes a state of tranquillity, and sleep then ensues. But if, by excessive or diseased action, such as in insanity, the inflamed (oxygenizing) matter cannot be made to yield its tendency to change, then chronic wakefulness ensues, so often seen in the case of the insane. To reduce this state, we endeavour to extinguish the erema-causis, by lowering the temperature either by cold ablution or by ice, or by administering opium to diminish respiration and circulation. As soon as the change is arrested in the substance of the brain (what physicians call "inflammation," which chemists interpret "union with oxygen"), the brain is placed in a state unfit for being the organ of manifestation, and sleep ensues. The wakefulness of patients afflicted with delirium tremens is obviously connected with the amount of arterial blood, and consequent inflammation and oxygenation of the brain, and as disease is merely a disturbance of the equilibrium in the causes of waste and those of supply, any magnified exhibition of a phenomenon occurring in disease must have its reduced analogue in the ordinary state of health. Wakefulness is that analogue, being a tendency to excessive change in particular parts of the brain, induced, it is true, not primarily by the change, but by the activity of the mind itself requiring that change to aid in its manifestation. Follow the analogy, and we come to dreaming, which, apart from its metaphysical aspect, is a physiological phenomenon, so far as concerns the state of the matter of the brain during its occurrence. In fever and insanity we attempt to reduce the keen perceptions or delirium by the exhibition of remedies calculated to diminish the waste of matter in the brain. Blood is sometimes withdrawn from the system for the purpose of diminishing the number of the carriers of oxygen. Narcotics are administered in order to decrease the number of respirations, and to diminish circulation. In extreme cases, large doses of brandy or other alcoholic liquors are exhibited, for the combined purpose of depriving the blood of oxygen and of arresting putrefaction.

By all these acts it is admitted that the excessive waste or oxygenation of the substance of the brain renders it unfitted for the proper seat of the mind. It is admitted that the rapid change of matter prevents the brain attaining that state which favours the quiescence of the mind. How it does so we do not know, and perhaps never shall. But these are established facts, the foundation of medical and physiological practice, and, therefore, cannot be denied. And if this be admitted with regard to the whole surface of the brain, may it not be so of a part? Combe tells us of a patient who was afflicted with an unnatural increase of a feeling of the mind, but that, by applying ice to a particular part of the head which was inflamed, the feeling subsided to its natural tone. Dreaming, then, might be considered (this I throw out as a mere speculation) to be a disturbance between the causes of waste and of supply in a particular part of the brain. I mean that if, to use the language of phrenologists, without necessarily assenting to their doctrines, the organ of Wonder, from some cause or another, be thrown into a state oxidation during sleep, that part of the brain would be thrown out of the condition which favours the quiescent state of the mind; Wonder would, therefore, manifest itself to the external world without being guided by the reasoning powers or judgment, which are in quiescence or sleep. Thus it would revel in all the absurd phantasies to which that feeling of the mind gives rise. I have selected this phrenological organ as a mere example of my meaning, without wishing to insist upon the division of organs as a necessary part of the speculation. If those parts of the brain used as the organs of manifestation for judgment were brought into play at the same time as Wonder, the dream would be more coherent, and, as soon as the change took place to such an extent as to throw the brain into that state which did not favour the quiescence of the mind, then waking would ensue. Hence, according to this speculation, dreaming is a state of wakefulness of feelings of the mind manifested through particular parts of the brain, while other feelings of the mind, manifested through other parts of the brain, are still asleep, and, therefore, not in the condition, by comparison and reflection, to modify those awake. It is probable that during dreaming there is more arterialized blood in the cavity of the head than during sleep without dreaming—a circumstance indicated by the red flushed appearance of the face during dreams. The speculation is also supported by the class of persons subject to dreaming. A phlegmatic person, whose heart beats slowly and whose lungs play slowly, rarely dreams. A fat person, with a diaphragm well pushed up against his lungs, rarely dreams. But the greatest dreamer is the man of nervous temperament, whose heart and lungs do not play with all the steadfastness of the pendulum of a clock, but by causes yet unexplained are fitful in their action. For the same reason, in fever, the quickly circulating blood, sometimes propelled more rapidly than at others, is apt to cause this state of wakefulness in particular parts of the brain, by throwing them into a state such as does not favour the quiescence of the mind. However, this is a subject which is thrown out as a mere speculation for consideration.

It may be objected to the view of sleep here given, that if it were owing to a diminished state of oxidation in the brain, the respiration of pure oxygen ought to retard sleep, whereas, on the contrary, it is observed to render the animal exposed to it comatose, and death ensues after the animal has remained for some time in a state of deep stupor. Yet both the blood in the veins and arteries was found by Broughton to be very florid, and everything indicates a high state of oxidation. Christison, and other toxicologists, ascribe the death to an increased oxidation or hyperarterialization of the blood. The phenomena, therefore, seem in direct opposition to our theory of sleep. But let us consider the case closely. Arterial blood differs from venous in the state of oxidation of its iron. The peroxide of iron parts with its oxygen to the tissues, and converts the matter acted upon into carbonic acid and water. The carbonic acid unites with the protoxide of iron, and is carried as carbonate of iron by the venous blood to the lungs, where it becomes oxidized, and the carbonic acid evolved; for this gas is incapable of uniting with peroxide of iron. Now, when an animal breathes oxygen, even the venous blood is arterialized—or, in other words, there is no protoxide of iron left in the system. But, owing to the excess of oxygen gas, there must be a rapid waste of the tissues, and the formation of a large quantity of carbonic acid gas, which has now no iron in a state to carry it to the lungs. It therefore accumulates in the system, and the animal becomes comatose and dies, not on account of *oxygen*, but of *carbonic acid*, which has no means of escape. It has been remarked that there is comparatively little carbonic acid evolved in poisoning by oxygen, for the atmosphere in which the animal dies causes a blown-out taper to burst into flame. The heart after the death of the animal is found to beat rapidly, and shows the excited state into which the body was thrown by oxygen, until the accumulating carbonic acid produced the peculiar effects for which it is remarkable. Thus, this simple explanation, while it vindicates the truth of the theory, affords an explanation of the cause of poisoning by oxygen, which toxicologists have always considered as most incomprehensible and singular. The effects of nitrous oxide on the system are very similar to those of oxygen, and are obviously due to the same cause. Broughton found that even the venous blood had become arterialized when an animal was made to respire this gas.

The attentive study of the peculiar condition of matter in the various states in which the mind manifests itself, or remains unmanifested to the external world, is of great importance in the treatment of disease. To take the case of apoplexy and its allied diseases. I do not allude to apoplexy occasioned by the rupture of an apoplectic sac, but that form in which it arises from the turgid state of blood-vessels in the brain, or in the more rare form of what is termed "simple apoplexy" by Dr. Abercrombie. The state in which the brain is placed in this disease seems to be merely an increased state of the condition in ordinary sleep. The congestion or turgid state of the venous vessels necessarily implies a diminished amount of blood in the arteries; for the skull, being a close cavity, must always contain the same amount of fluid, and on this account, if the quantity of venous blood be increased, that of arterial blood must be diminished. Hence, although the use of the lancet may awaken the patient from deep stupor, by removing the deoxidized blood which may have accumulated in the brain by the lesion of a vessel or by some irregularity in the action of the heart, yet it becomes a question whether the removal of blood, by diminishing the number of carriers of oxygen to the brain, may not cause a tendency to relapse when the temporary obstruction shall have been removed. All I mean by this is, that if we admit the cause of sleep to be a diminished supply of oxygen to the brain, we must admit certain forms of disease, such as congestive apoplexy, syncope, perhaps even catalepsy, to be due to the increased operation of the same cause

—a circumstance attested by the diminished temperature of the body which results in this class of diseases; if, then, we know the effects to be due to a want of oxygenation of the substance of the brain, we are in a position more completely to regulate our practice in the treatment of such diseases. So, also, in the treatment of wakefulness, dreaming, restlessness, &c., for which the physician is so often called upon to prescribe a remedy, the knowledge of the state of the brain in the state of waking and of sleep, may point out the way to throw it into the state which favours the activity or quiescence of the mind. Hence an accurate definition of these states is not unimportant in a practical point of view.

It does not necessarily impair the accuracy of such a definition that many assumptions are taken for granted to explain one part of the phenomenon. When we see a wheel revolved by the ascent and descent of a piston-rod, our explanation of the means by which a perpendicular is converted into a rotatory motion is not rendered valueless because we do not trace it to the means by which the force is generated. We have a right to assume the existence of the necessary force, and from this point alone attempt an explanation. So, also, when I say that the effect of a diminution in the play of the respiratory organs induces sleep, as in the case of intense cold, or that their accelerated action retards sleep, as when the temperature is only slightly depressed, my conclusion may be perfectly correct without my being called upon to prove the cause of the diminution in the action in the one case, or its increase in the other, because my attention is confined only to one part of the phenomenon. So, also, if I say that syncope is due to a diminished quantity of arterial blood in the brain, I may be correct as to the proximate cause, without being obliged to show by what means the conducting power of the nerves leading to the involuntary organs has become so impaired as to cause the temporary obstruction of these organs. In describing the chemical state of the body, and the effects produced by this state, the duty of the chemist is only to consider the proximate cause of its production, while the physiologist ought to explain the ultimate causes which predispose the body to enter into that state. I have attempted to explain in certain cases one part of the phenomenon, not for the purpose of giving idle play to fancy, but with the hope that these speculations, if they do not of themselves represent the truth, may lead other persons to the consideration of the same subject. — *Northern Journal of Medicine.*

REVIEWS.

New Methods of Alkalimetry, and of Determining the Commercial Value of Acids and Manganese. By Drs. C. R. Fresenius and H. Will. Edited by J. Lloyd Bullock. Taylor and Walton. pp. 152.

This little volume is one of the comparatively few chemical works which have been translated from the German into the English language. It endeavours to point out, in plain and intelligible language, the defects of the processes hitherto adopted for ascertaining the strength and comparative purity of such acids and alkalies as are met with commercially, and proceeds to develope a new method of arriving at these important results with greater ease and accuracy than heretofore. The same process is also ingeniously applied to the examination of commercial ores of manganese, and the discovery of their comparative value to the bleacher and others. Numerous examples relating to the processes are interspersed throughout the volume, which is, in the full meaning of the term, a practical work. It is, however, to be regretted that, in translating the volume into English, the French weights and measures should have been allowed to remain.

In reviewing the methods of alkalimetry previously adopted, the authors remark, that "the principle upon which the alkalimetrical method of Descroizilles and its modifications are based may be most simply explained as follows:—Potash and soda being mixtures of carbonated alkalies and extraneous salts, if an acid (*e.g.*, dilute sulphuric acid) be added to their solutions, the characteristic properties of the acid disappear to a certain extent, and it becomes neutralized. Those constituents of the potash and soda which we have termed extraneous salts contribute nothing to this neutralization; it is effected by the carbonated alkalies alone. The sulphuric acid is neutralized by expelling the weaker and more volatile carbonic acid, and then combining with the liberated bases potash and soda, forming neutral salts with them. It follows, from the universal laws which govern the combination of substances, that the quantity of sulphuric acid which thus loses its acid properties must be proportional to the quantity of the alkali with which it combines. If, therefore, we know the quantity of the former, and the proportion in which the alkali saturates the acid, we can, of course, also determine the quantity of alkali which was combined with carbonic acid, and thus the proportion of carbonated alkali contained in the substance under examination."

This description of the principles of alkalimetry is unexceptionable.

The objections against the old method urged by our authors are, the imperfect means of ascertaining by measure the quantities of the test-acid required for the saturation of the sample of alkali under examination; the difficulty of attaining the exact point of saturation by the employment of blue litmus tincture, which changes to red by excess of acid; and lastly, the property possessed by certain impurities, constantly present in commercial alkalies, of neutralizing sulphuric acid in the same way that the carbonated alkalies themselves do.

The last is, no doubt, the most weighty objection; and if all the others be equally well grounded, the process of Drs. Frescnius and Will must at once be acknowledged beyond comparison superior to all that have preceded it. It appears, however, that the authors have omitted to refer to the very best of all the old alkalimetrical processes; and on this account we shall briefly describe the routine of the examination of potash or soda by the alkalimeter of Schuster. A test-acid is prepared by diluting the sulphuric acid of commerce with distilled water; its strength is determined by ascertaining, *by weight*, the quantity required to neutralize a known weight of *pure fused* carbonate of soda, or perhaps more accurately by projecting a known weight of the test-acid into a solution containing excess of chloride of barium, and calculating the saturating power of acid from the weight of the precipitated sulphate of baryta. To perform the alkalimetrical assay with the test-acid thus prepared, a small light flask, capable of holding from one and a half to two ounces of distilled water, and furnished with a stopped opening and a capillary spout, is necessary. This little vessel, of which a drawing may be seen at page 3 of Griffin's catalogue, is about four-fifths filled with the test-acid. A convenient quantity—say thirty grains—of the alkali to be examined is placed in a glass beaker with two and a half or three ounces of water. A small piece of neutral litmus paper is allowed to float in the alkaline solution, which is now placed over a spirit lamp with a small wick. Thus prepared, the weight of the alkalimeter and contents is ascertained, and we proceed to neutralize the alkaline solution. By blowing with the mouth into the opening, we propel a stream of the test-acid into the solution; when the neutralization is very nearly effected—a point ascertained by the smallest experience—the stopper is replaced, and the remainder of the acid is added drop by drop to the solution, to effect which it is only necessary to heat the alkalimeter by holding it in the hand. In this process the neutralization is effected in three or four minutes, and the carbonic acid is expelled by the employment of the spirit lamp; while the difference in the weight of the instrument before and after the experiment gives the quantity of the acid employed, from which is deduced with case the amount of real alkali contained in the sample of commercial potash or soda submitted to examination. If thirty grains of the crude material be employed, the per centage will multiply any error which may have occurred by $3\frac{1}{3}$; and even when thus multiplied, and when the experiment has been performed with only ordinary care, the difference between the results of repeated experiments on the same alkali will never exceed half a per cent.

By the process of Drs. Frescnius and Will, the per centage of real alkali is estimated by the loss of carbonic acid evolved in consequence of the combination of the alkaline base with sulphuric acid, as in the analysis of calcareous carbonates, marls, &c. To use the words of the authors themselves: "Now, the method of alkalimetry hitherto applied endeavoured to attain this object by determining the quantity of the alkali, calculating it by the measure of acid which is required for its neutralization; our method attains the same object by determining the quantity of the carbonic acid which was combined with the alkalies." * * * * "We have, therefore, constructed a new apparatus, in which the drying of the (expelled) carbonic acid is not effected by chloride of calcium, as is the case with all the former apparatus, but in the most simple manner, by the same sulphuric acid which is employed to expel the carbonic acid from its combination. This apparatus allows us to decompose a considerable quantity; the operator need not apprehend that he has employed the acid in an insufficient quantity; the water is far more completely retained than is possible by chloride of calcium, whenever the evolution of gas is at all rapid; moreover, the application of heat is rendered perfectly unnecessary, the sulphuric acid performing this service also."

We regret that it is not in our power to give a drawing of the simple apparatus of Fresenius and Will, consisting merely of two small flasks connected by a tube, through which the sulphuric acid is forced by the compression of the air produced by blowing into the vessel containing it, so as to bring it into contact with solution of the carbonated alkali.

There are objections to this process, viz., the employment of perforated corks, thin glass tubes, the length of time required for cooling the apparatus, its weight, and the great rapidity with which carbonic acid is evolved; so that upon the whole we are inclined to consider it less convenient, and not more accurate, than the method of Schuster which we have noticed.

There are, however, many points in this little work worthy the highest commendation. Among these are the methods of converting sulphurets, sulphites, &c., into sulphates by the addition of chromate of potassa—the systematic method by which the proportion of caustic alkali in commercial articles is deduced, and the rules laid down for the detection of the frequently occurring impurities. Nor ought we to omit to mention the novel and superior plan adopted by our authors of expressing the value of alkalies.

The second part of this work is devoted to acidimetry, the same apparatus being still employed as in alkalimetry.

The concluding portion of the little volume treats of the examination of ores of manganese. There is, however, nothing particularly worthy of especial notice here, as the process recommended is merely the application of the apparatus of Fresenius and Will to the method of Berthier and Thomson, by which the amount of carbonic acid evolved from oxalic acid is determined.

CHEMISTRY, PHARMACY, MATERIA MEDICA AND THERAPEUTICS.

On the Preparations of Iron recently introduced into Practice.—The preparations of iron are most deservedly in high esteem with practical medical men. The reputation of these preparations, in the treatment of diseases, has probably varied less for a long time past than that of most remedies of similar pretensions. There are, indeed, some indications of their having been held for a time, since the commencement of this century, in a degree of suspicion with a part, at least, of the profession; and this suspicion seems to have arisen from their well known power of acting as a stimulus to the vascular system—of increasing

the force and frequency of the heart's action—a property which was naturally enough thought to be incompatible with their use in any chronic disease, where by possibility there might be inflammatory action secretly going on.

But it seems now well established that there are chronic diseases attended with some degree of the inflammatory process—for example, chronic inflammation of the mucous membranes, chronic diarrhœa, chronic dysentery, enlargement of the liver or spleen, and ulcerations of the surface—in which those conditions are present that determine the utility of the preparations of iron. Besides, it was more the practice some years back than it is now to ascribe morbid alterations of tissue, such as so often characterise chronic diseases, to inflammatory action. And if the recent introduction of the term *diseased nutrition*, to represent a part of the morbid agency in the production of textural alterations, before referred to inflammatory action, has been of no other use, it has at least left us more free to observe the effects of remedies on many chronic diseases, without the bias given to the mind by the ideas which inflammation cannot but call up.

As respects the preparations of iron, however, in diseases generally, the risk at present is, from the universal attention paid to them, that their use will be carried beyond just bounds, rather than that they shall be employed less than they deserve.

And yet the indications for the use of iron in diseases have always been tolerably simple, and perhaps it is not premature to pronounce that these are already becoming still more simple than before. We refer to the exact evidence recently brought forward of what has been conjectured for many years past, namely, that iron used as a remedy goes directly to the nutrition of the blood, when the blood has fallen into an impoverished state. On this subject the memoir of Andral and Gavarret is highly interesting, as well as Andral's more recent little work entitled "Hematologie."

It is hardly too speculative, when we look to the facts detailed in the memoirs just referred to, to represent the state of the system which calls for the use of iron in the following manner:—The iron of the blood, in the healthy state of the system, is drawn from the organic matters containing it employed as food; but in certain states of ill health the nutritive powers become inadequate to extract a sufficency of iron from the ordinary food, for the maintenance of the blood in its perfect state; while, if iron be given in the mineral state, the blood becomes restored more or less quickly to a healthy constitution. Thus, then, under this view, iron becomes an aliment rather than a medicine; or, like common salt and water, it is an aliment from the mineral kingdom.

Hence, besides the old indications for the employment of iron drawn from the languor of the circulation, the inactivity of the respiratory acts, and the depression of the nervous system, we obtain in addition the impoverished state of the blood or the proportionate deficiency of the red corpuscles—a deficiency which may be ascertained with or without the use of the microscope. The same view affords a satisfactory rationale of the difference between the effects of iron as a stimulant on the living system and those of such stimulants as alcohol, opium, and the like. The latter agents, like iron, increase the force of the circulation, the activity of the respiratory acts, and the energy of the nervous system, while digestion, secretion, and absorption, participate in the general excitement, and the whole system feels a fresh tone. But these effects are short-lived; there is expended on them much of the ordinary resources destined to maintain the body in vigour for some time to come, and hence present exhaustion must ensue. There is a collapse of the system marked by languor of the circulation, deficiency of respiration, abatement of the healthy vigour of secretion, and depression of the muscular tone.

And the reason is, because the last named stimulants possess little or no nutritive property. The exitement they produce is necessarily, therefore, a process of exhaustion; unless, indeed, the system has previously fallen below its healthy standard, in which case such stimulants act the part of permanent tonics, by bringing the functions of maintenance nearer to the level of healthy vigour. But the preparations of iron, under the view above referred to, not only stimulate, but at the same time supply to the blood the means of sustaining the expenditure of substance produced by their stimulus.

But enough of these generalities; we propose to give a short notice of the preparations of iron recently brought into use.

Notwithstanding the difficulty of preventing the protosalts of iron from passing spontaneously into the corresponding persalts, a very general belief has sprung up that the former are of greater utility, in a medicinal point of view, than the latter. It is true that the rust of iron and the old precipitated carbonate are known by long experience to be beneficial in diseases, and it is equally certain that the discovery of chemists that they are not carbonates cannot invalidate their claim to this title. Why, then, it may be asked, take so much pains to exhibit iron in the form of a true carbonate, if there be no experience till of late of its utility, while there is the experience of many years in favour of the sesquioxide into which the carbonates spontaneously pass? But since it is quite possible that, while the sesquioxide is useful, the true carbonate may be more useful, let us consider on what ground of experience the latter persuasion rests. The antihectic mixture of Griffiths, represented officinally by the compound mixture of iron and by the compound iron pills, has, from an early period, enjoyed a high reputation among practical men, in spite of the efforts of chemists and pharmaceutists, who rest their opinions on theory too little qualified by experience in the actual treatment of diseases to banish it as unscientific.

It is now found that this supposed unscientific mixture is the only form in which we have any long experience of the medicinal effects of iron in the state of carbonate. And hence arises a probability that the reputation of the compound iron mixture in diseases depends on the iron being in the state of carbonate of the protoxide. It is retained in that form by the presence of sugar, which, according to the singular discovery of the German chemist Klauer, prevents the decomposition of the carbonate of the protoxide by preventing the protoxide from passing into the state of sesquioxide. The same statement applies even more forcibly to the solid form of the same combination, the compound iron pills, or Griffith's pills.

Previous to the announcement of Klauer's discovery, Dr. Clark, of Aberdeen, had proposed to preserve the precipitated carbonate from passing into sesquioxide by avoiding any drying of it, and making it at once, after merely squeezing it, into an electuary with sugar and aromatics. And Dr. Christison had also previously observed that the iron of this electuary had not lost its carbonic acid even when it became quite dry.

In the first English edition of the Edinburgh Pharmacopœia, advantage was taken of Klauer's discovery, and a saccharine carbonate of iron introduced. This saccharine carbonate is found to be a mixture of the carbonate, of the protoxide, and the sesquioxide. A pill of the saccharine carbonate was introduced at the same time. Many practitioners have of late adopted the use of the carbonate of iron made extemporaneously at the moment of being taken. The formulæ for this purpose contain some soluble salt of iron, with an alkaline carbonate, as the solution of the sulphate with the carbonate of soda. From 8 grains of sulphate of iron, and 10 grains of carbonate of soda in solution, an effervescing draught is obtained, containing 10 grains of carbonate of iron. The tincture of the muriate is also used in the same way with an alkaline carbonate. Besides these preparations, the sulphate and the black oxide contain iron in the state of protoxide, combined in the latter with the sesquioxide. Or the London Pharmacopœia contains three preparations in which the iron is in the state of protoxide, namely, the mistura ferri composita, the pilulæ ferri compositæ, and the sulphate of iron; while the Edinburgh Pharmacopœia contains the same, with the exception of the pilulæ ferri compositæ, and has besides the saccharine carbonate, the pills of the saccharine carbonate, and the black oxide, now made by precipitation after the formula of Wöhler.

More recently it has been found that sugar has also the effect of preserving the protiodide of iron from passing into the periodide. And this discovery has been taken advantage of in the new preparation of the Edinburgh Pharmacopœia, the ferri iodidi syrupus.

The most important new officinal preparation in which the iron is in the state of sesquioxide is the hydrated sesquioxide, termed, rather unhappily we think, by the Edinburgh College, Ferrugo. This is the substance recommended as an antidote to arsenic, and it will most probably be found to supersede the common rust and the sesquioxide formed from the precipitated carbonate.

Besides these officinal preparations, many others have been recommended of late, and some have come into use.

The following table includes those more worthy of notice:—

	Dose.
Ferri bromidum	gr. iii. to gr. viii.
Pilulæ ferri bromidi	gr. i. in each.
Ferri citras	gr. v. to gr. viii.
Ferri ammonio-citras	gr. v. to gr. viii.
Ferri et Quinæ citras	gr. iii. to gr. vi.
Aqua chalybeata (citrate of iron in water charged with carbonic acid, and flavoured with aromatics)	℥ii.
Ferri potassio-citras	gr. v. to gr. viii.
Liquor ferri potassio-citratis.	
Ferri tinctura aurantiaca (iron filings, Seville oranges, Madeira, &c.)	℥i. to ℥ss.
Ferri lactas	gr. vi. to gr. xii. in the day.
Ferri lactatis syrupus.	
Ferri lactatis trochisci.	
Ferri ammonio-tartras	gr. v. to gr. viii.
Ferri tannatis syrupus.	
Ferri confectio composita	℥ss.

The bromide of iron is deliquescent and very soluble. The dose is from 3 to 8 grains. The pills are made with *q. s.* of extract of liquorice, each containing one grain of bromide. Their use is against glandular enlargements, hypertrophy of the uterus,* &c.

The citrate and ammonio-citrate of iron have been met with in the shops for some time. The citrate is permanent in air, sparingly soluble in water, very soluble in boiling water, and the solution reddens litmus-paper. The ammonio-citrate is deliquescent, soluble in cold water, neutral to test-paper. The citrate is made by saturating a hot solution of citric acid with moist hydrated sesquioxide of iron; and the ammonio-citrate is made by adding enough of aqua ammoniæ to the same solution to render it neutral.

The citrate of iron and quinine is made by mixing 4 parts of citrate of iron with 1 part of citrate of quinine. The citrate of quinine is made by dissolving pure quinine in a solution of citric acid.

The ammonio-citrate, as soluble, is preferable to the citrate. The dose of either is from 5 to 8 grains. The ammonio-citrate should be given in solution. The dose of the citrate of iron and quinine is from 3 to 6 grains. The form of pill answers best for this medicine. The uses of these preparations are much the same as those of the tartrate.

The aqua chalybeata, made by Bewley and Evans, of Dublin, contains 13 grains of citrate of iron in 6 oz. The dose is 2 oz. two or three times a-day.

The tinctura ferri aurantiaca is contained in the Wirtemberg Pharmacopœia. It is an agreeable preparation, the dose being from one drachm to half an ounce.†

The ferri potassio-citras and its syrup are recommended by Dr. Todd, and the mode of pre-

* See Neligan, Conspectus of the Pharmacopœias.

† See Medical Times, 11th March, 1843, p. 386; London and Edinburgh Journal of Med. Science, January, 1843; Neligan, Conspectus of the Pharmacopœias.

paring them may be seen in the "Lancet," 10th September, 1842, p. 822.

The lactate of iron contains the protoxide. It is met with in small acicular greenish prisms, or in powder of a pale green colour. It contains three equivalents of water of crystallization. It is sparingly soluble, and during solution passes into a higher state of oxidation. It is made by adding iron-filings to lactic acid. The syrup and lozenges are made on the common plan. The dose of lactate of iron is from 6 to 12 grains in 24 hours. Use, in chlorotic diseases, atonic amenorrhœa,* &c.

The syrup of tannate of iron is made from citrate of iron by adding simple syrup, syrup of vinegar, and extract of galls. The iron is said to be in the state of protoxide.†

The ferri ammonio-tartras occurs in brilliant scales, semi-transparent, and of a reddish brown colour. It is soluble in cold water. It consists of one equivalent of tartrate of protoxide of iron, one equivalent of tartrate of ammonia, and four of water. It is made by adding hydrated sesquioxide of iron to a solution of tartrate of ammonia. It is permanent in composition, and is given to the extent of from 5 to 8 grains, in powder, pill, or solution. It is recommended chiefly in derangements of the uterine organs.‡

The confectio ferri composita, made according to a formula given by Mr. Heathcote, of Gosport, contains clinkers, the scoriæ got from the blacksmith's shop. These appear, from several accounts published of late years, to have been long a popular remedy. Mr. Heathcote says that they are much used in Bath under this form.

Take of clinkers reduced to an impalpable powder, 8 oz.; carbonate of magnesia, ½ oz.; powdered ginger, 1 drachm; treacle, a sufficient quantity; make an electuary; ½ oz. for a dose.—*Northern Journal of Medicine.*

Report of an American Pharmaceutical Committee on an Important Paper of Thomas J. Husband on Syrup of Sarsaparilla.—The subject treated of in the paper may be resolved into a solution of the following query, viz.: what is the most efficient menstruum for extracting the activity of sarsaparilla? The author, after a series of well-conducted experiments, arrives at the following conclusions:—

1st. That diluted alcohol is fully adequate to the removal of all the activity from sarsaparilla.

2d. That cold water is inadequate to wholly extract the virtues of that root, because, after its action, much acrimony remains, which can then be removed by diluted alcohol.

3d. That warm water (180° Fah.), when applied in large quantity, did not remove all the acrimony from the root.

And *lastly*, these premises being correct, the obvious impropriety of the *second formula* of the United States' Pharmacopœia, which directs the employment of cold water, by displacement, as a means of making the syrup.

Before giving a detail of the results of their experiments, the committee beg leave to make a few statements, drawn from prominent French authority, which have a direct bearing on the subject, and which will assist in its consideration.

Soubeiran states that sarsaparilla contains, according to the best analyses, volatile oil, salseparine, bitter acrid resin, oily matter, extractive matter, starch, and albumen.

Salseparine is colourless, inodorous, crystallizes in radiated groups, and is a neutral substance. When dry, it has only a slight taste, but its solution is acrid, and rather bitter. It is a little soluble in cold water, more soluble in hot water, and its solution possesses, in a high degree, the property of frothing by agitation, like soapy water. It is dissolved readily by cold alcohol, but to a greater extent when it is hot, the excess of salseparine separating by cooling.

Infusion of sarsaparilla, which is odorous and sapid, loses its odour and taste when boiled for a short time, which speaks little in favour of the decoction (see *Traité de Pharm.*, tome ii., p. 62). Further, when sarsaparilla is treated with water, it is easily deprived of its extractive matter; and, if we may judge from the colouration of the liquid, it is soon exhausted. But after the root has ceased to colour the menstruum, the fluid which passes possesses the power of frothing by agitation, which is due to the salseparine it contains, the latter substance having been but partially removed from the root by the first treatment. From this circumstance, it is necessary to employ very considerable quantities of fluid; and hence the method of displacement does not present any advantages in the aqueous treatment of sarsaparilla.

Both Soubeiran and Guibourt give the preference to a syrup made with the hydro-alcoholic extract, dissolved in water. Although a solution of that extract in water deposits salseparine by standing, yet, when made into a syrup, Guibourt remarks that it takes a long time for even a small deposition to take place.

We will now detail our experiments, and it will be seen that they corroborate the statements above, as well as those of the paper referred for our consideration.

Six ounces of sarsaparilla were obtained in coarse powder, by sifting from the ground root, composed principally of the cortical portion. One half of this was macerated in eight fluid ounces of water for three days, and then subjected to displacement until one pint of fluid was obtained. This infusion, which possessed the peculiar odour of sarsaparilla in a marked degree, was placed in a capsule, and suffered to evaporate, at a temperature varying from 120° to 150° Fah., to the consistence of an extract, which we shall call No. 1.

The sarsaparilla, when removed from the apparatus and dried, was found still to possess some acrimony when chewed, and was treated with diluted alcohol, until eight fluid ounces of tincture were obtained; the latter yielding, by evaporation, a small quantity of dry resinous extract, No. 2.

The remaining three ounces of ground sarsaparilla were macerated in eight fluid ounces of diluted alcohol for four days, and subjected to displacement until one pint of tincture was obtained. This was perfectly transparent; but when evaporated to six fluid ounces, a few grains of dark insoluble matter precipitated, which was separated by a filter, and the clear fluid evaporated to an extract, No. 3. The root which remained possessed no acrimony.

These different products were then carefully examined, with a view to their embodying the sensible properties of the sarsaparilla; and the committee, with others not of their number, agreed in the correctness of the following statements:—

No. 1. This extract was translucent in thin layers, dark coloured, and very soluble in water. It possessed the odour, bitterness, and acrimony of sarsaparilla in a considerable degree, and doubtless consisted of the extractive, with more or less salseparine and volatile oil. This extract was more efficient than most of that in the shops.

No. 2. The extract, prepared with diluted alcohol, also had the odour of the root, but its taste was more bitter and acrid than No. 1, due to its containing all the acrid resin and salseparine of the quantity of root employed. It dissolved almost completely in water.

No. 3. This extract possessed the peculiar acrimony of sarsaparilla more decided than either of the others, it being composed principally of acrid resin and salseparine, with some extractive.

One-tenth of a grain of the extract No. 2, when agitated with half an ounce of water, was sufficient, by long agitation, to convert all the fluid into froth. No. 3 possessed this character less than No. 2, and more than No. 1. This affords a means of judging approximately as to the relative amount of salseparine contained in the three extracts.

The insoluble matter which precipitated during the evaporation of the tincture of sarsaparilla, had but a very slight taste of that root, and hence the preparation is not weakened by its separation.

In making compound syrup of sarsaparilla with diluted alcohol in the usual way, the resinous matter taken up by the menstruum from the guaiacum is nearly all precipitated, and if not separated subsequently, gives the syrup an opaque appearance.

The committee believe that if the sarsaparilla were treated separately with diluted alcohol, and the residue with water, and the resulting tincture and infusion evaporated to the proper quantity, a more beautiful preparation would result, equally efficient.

In reference to the second formula in the United States' Pharmacopœia, the committee would observe, that it is the same as that recommended by the committee of revision of the Philadelphia College of Pharmacy. That committee, when engaged on the subject, concluded, from the results of experiments submitted to them at the time, that water was adequate to the extraction of the activity of sarsaparilla, and that all those portions soluble in an alcoholic, and insoluble in a water menstruum, would be precipitated when the alcohol was removed. The remark applies to the guaiacum, but to the sarsaparilla only after standing for several days; for although pure salseparine is but little soluble in water, yet the results of our experiments sufficiently prove that when its solution is effected by treating the root with a mixed menstruum, the alcohol may be removed by evaporation, without the salseparine immediately separating; and the subsequent mixing of this solution with sugar, according to Guibourt, prevents it nearly altogether. This is probably owing to its association with substances which retard its crystallization; and the committee believe that, owing to the same causes, cold water extracts and holds in solution more salseparine than if the same amount of that principle, in an isolated state, was submitted to its action. M. Beral, in a paper published several years since, in the *Journal de Chimie Médicale*, strongly advocates the use of cold water as, where heat is employed, the activity of the preparations suffers. (See *American Journal of Pharmacy*, Vol. XII., p. 245.)

In conclusion, the committee will observe, that the syrup, carefully made with cold water as a menstruum, possesses, in a very considerable degree, the virtues of its ingredients; but they are convinced that diluted alcohol, employed as directed in the first formula of the United States' Pharmacopœia, is the more eligible medium for its preparation; and in this they fully accord with the views contained in the paper referred for their consideration.—*Amer. Journ. of Pharm.*

To make India-rubber Court Plaster, by W. B. C. Rowland.—A stout frame of wood must be made about three yards long (or any length that would be most convenient), and about one yard and a quarter wide. Within this frame must be placed two sides of another frame running longitudinally and across, so fixed in the outer frame that the two pieces may slide, independently of each other, backward and forward about six inches.

Tapes of canvass must be tacked round the inside of the inner frame, so as to form a square for the material to be sewed in; which when done, the two loose frames must be drawn tightly to the outer, by means of a twine passed round each, in order to stretch, perfectly free from irregularities, the silk or satin previous to laying on the composition. Dissolve India-rubber in naphtha, or naphtha and turpentine, and lay it on with a brush, on the opposite side to that which is intended for the plaster, and when perfectly dry, and the smell in a great measure dissipated, it will be ready for the adhesive material; to make which—take equal parts of Salisbury glue, or fine Russian glue, and the best isinglass, dissolved in a sufficient quantity of water over a water-bath, and laid on with "a flat hog-tool" while warm. It is requisite to use great caution in spreading the plaster evenly, and in one direction, and a sufficient number of coatings must be given to form a smooth surface, through which the texture of the fabric is not perceptible. Each coating should be perfectly dry before the succeeding one is given, and placed in a situation free from dust, and where a draught of air would facilitate the drying. The quantity of water used, and the weight of the two materials, must be a little varied

* Memoir by MM. Gelis and Coute; also Medico-Chirurgical Review, October, 1840, p. 511; and Neligan, Conspectus of Pharmacopœias.

† See Medical Times, 11th March, 1843.

‡ See Procter in American Journal of Pharmacy; also Neligan's Mat. Med., p. 359.

according to the season, and the gelatine strength they possess.

Lastly, the plaster being ready to receive the polishing coat, which gives also the balsamic effect to it—a preparation is made in nearly the same manner as the tinctura benzoini composita of the Pharmacopœia, with the addition of more gums; this preparation must be laid on once only, and with a brush kept for the purpose. For making plasters on coloured silk, it is only necessary to select the silk a shade deeper than the colour required, as the plaster causes it to appear a little lighter.

The process being finished, the plaster must be cut out of the frame with scissors, as near to the canvass to which it is sewed as it will admit. For sale, it is cut up in squares, which is best done by means of a compass and rule.

The Harrowgate Spring, says Dr. A. T. Thompson, rises in a bed of shale, superimposing mountain lime-stone, and covered by magnesian lime-stone. The water of the old well is limpid, colourless, and transparent: its temperature is 49°; its odour powerfully fetid; and its taste saline and nauseous. It blackens the salts of lead, and gives a chocolate-brown precipitate with ammonio-nitrate of silver. The wine pint contains nearly two cubic inches of sulphuretted hydrogen gas, 1. 1-10th cubic inch of nitrogen, 1·18 of carbonic acid gas, and nearly one cubic inch of carburetted hydrogen gas. The other ingredients are chloride of sodium, bicarbonate of soda, chloride of calcium, sulphate and carbonate of lime, and chloride of magnesium, with a trace of carbonate of magnesia. Some of the continental waters of this class contain seven cubic inches of sulphuretted hydrogen gas in the wine pint.

These waters operate as powerful excitants, and their employment requires more discrimination and caution than any of the other mineral waters. They are contra-indicated in irritable, nervous temperaments; in those predisposed to headache, and affections of the brain; and those having a tendency to hæmorrhage of the lungs. When used as baths, they clear the skin of eruptions depending on a diseased action of the secreting vessels, sympathising with a deranged condition of the digestive organs. Taken internally they operate as purgatives, diuretics, or diaphoretics, according to the condition of the system of the patient at the time of using them; they especially augment the flow of the bile.

On the Citrates of the Protoxide and Peroxide of Iron, by W. Heldh.—*Citrate of Protoxide of Iron.*—Metallic iron, whose surface is free from oxide, is dissolved by dilute citric acid, with the development of hydrogen gas. A saturated solution has a yellow tinge, and, on the addition of alcohol, a white flocculent precipitate is formed, which is the citrate of the protoxide of iron. By standing it becomes brown, and shrivels.

Citrate of Peroxide of Iron.—Newly precipitated hydrated peroxide of iron dissolves when heated with citric acid, and forms a reddish-brown sweetish fluid, from which alcohol precipitates a reddish-brown neutral salt. The aqueous solution forms a precipitate with the caustic alkalics and their carbonates, also with the ferrocyanide of potassium. The solution, on evaporation, assumes the consistence of syrup, and may be dried in a water-bath. When dry, it presents itself as thin light brown plates, with a metallic lustre, which, on being removed from the sides of the vessel, split into a number of transparent shining lamellæ. In this form the salt is met with in commerce in England, where it is used for medicinal purposes. Bibasic citrate of soda dissolves recently precipitated hydrated peroxide of iron, yielding a red brown solution, which dries in the form of a dark-brown mass, with a metallic lustre: it absorbs water from the atmosphere, then becomes turbid, and gradually deliquesces. Liebig brought a series of the double salts of the peroxide of iron from London, prepared by Mr. Bullock, by drying the aqueous solution, when evaporated to the consistence of syrup, in thin layers on glass or porcelain plates, at a temperature of 212° Fah.—*Pharmaceutisches Central Blatt*, and *Pharm. Journ.*

Pharmacy in England, by Richard Phillips, F.R.S.—Having lately been absent from London, I heard that there was residing, in the neighbourhood of the place which I visited, a chemist and druggist, of no ordinary degree of pretension, and of attainments which were not supposed to warrant the opinion that he had formed of his own superiority. To this person's shop I went, and found, by his handbill, that he was not content with being considered as a simple chemist and druggist, for he has, in the document just alluded to, announced himself as M.D., M.F.P.S.G., and M.R.V. Inst. Lond.; the meaning of several of these letters, though I cannot with any certainty decipher, I might, perhaps, not unaptly supply without any great stretch of imagination.

To this person I presented a paper, on which was clearly written *potassæ hydratis*, ℥ij., and he supplied me with what he labelled *hydr. pot.*, ʒij. This brief nomenclature might have been intended to describe the article for which I had written, but as the substance actually contained in the vial was in small colourless crystals, instead of brownish or drab-coloured sticks, it evidently was not that which I had ordered. On examination, I found it to be what I suspected, both from its appearance and from the facts mentioned in my last communication, namely, iodide of potassium. It was, however, of very inferior quality, being extremely moist, in ill-defined crystals, and contained iodate and carbonate of potash. This country chemist, therefore, like some of his London brethren, was puzzled by the genitive case.

The preparation which I shall next describe, as having been purchased and examined, is *acidum aceticum*.

The London Pharmacopœia of 1824 contained, in the materia medica, what was called acidum aceticum fortius, the specific gravity of which was stated to be 1·046, and 100 parts of it saturated 87 grains of crystallized carbonate of soda. In the present Pharmacopœia a process is given for obtaining acetic acid of sp. gr. 1·048, and its saturating power is similar to that above given.

I purchased six samples of this acid (at different druggists' shops), and examined their properties:

No. 1. Specific gravity 1·048. Contained only a slight trace of sulphuric acid; sulphuretted hydrogen did not discolour it; this sample was, therefore, nearly pure, and was of the proper sp. gr. and strength, or about 31 per cent.

No. 2. Specific gravity 1·043. Contained small portions both of sulphuric and hydrochloric acids; sulphuretted hydrogen did not discolour it; the sample, therefore, judging from its density, was about 2 per cent. too weak.

No. 3. Specific gravity 1·048. Contained no sulphuric acid, and was not discoloured by sulphuretted hydrogen; this sample was, therefore, in every respect good.

No. 4. Specific gravity 1·035. It was, therefore, two weak by about 9 per cent.; and, as it contained a large quantity of sulphuric acid, and a considerable quantity of hydrochloric acid, it was still weaker than denoted by its deficient density. Sulphuretted hydrogen showed, however, that it was free from metallic impregnation.

No. 5. Specific gravity 1·008. The chemist from whom I procured this inquired whether I wanted *strong* acetic acid, to which I replied that I required the acetic acid of the London Pharmacopœia. Adverting, I presume, to the Parmacopœia of 1824 instead of the present, he intended, I suppose, to give me what was therein called acidum aceticum dilutum—properly distilled vinegar. To prepare this he diluted the stronger acid with water, and it will be observed that what I obtained was very nearly of the density of distilled vinegar. It contained a very large quantity of sulphuric and considerable hydrochloric acid; sulphuretted hydrogen did not discolour it.

No. 6. Specific gravity 1·006. I asked for acetum destillatum, and this was given to me as such. The density is nearly or quite correct. It had not, however, the peculiar odour of distilled vinegar, and was evidently diluted acetic acid. It contained both sulphuric and hydrochloric acid; but sulphuretted hydrogen denoted the absence of metallic impregnation.—*Pharm. Journal.*

Steel Wine, by M. Soubeiran.—On leaving white wine to act on iron filings, the quantity of iron which enters into solution depends upon the proportion of acid contained in the wine, and on this account the product must be liable to variation. On the other hand, if the formula given by Parmentier, and adopted in several works, which consists in adding tincture of tartarized iron to white wine, be followed, the composition of the steel wine will be still more variable, for the tincture of tartarized iron is a very uncertain preparation; moreover, the medicine thus prepared would not resemble in composition that made by the direct action of the wine on metallic iron.

In adopting the following formula, the inconveniences above alluded to will be avoided; while, at the same time, there will be the advantage of its being applicable to the preparation of any quantity, however small, of the medicine, and of its occupying a very short time:—

Take of Tartrate of protoxide of iron .	1 part
Tartaric acid	1 ,,
White wine	1000 ,,

Rub the tartrate of iron and tartaric acid together in a porcelain or glass mortar, then add the white wine, and filter the solution if necessary.

M. Beral has recommended, in order to prevent the discolouring of the wine by the iron, to add a little hydrated peroxide of iron to the wine first, to shake them together and filter, then to add the filtered wine to the iron filings. The effect is precisely as indicated by M. Beral; but if Bourdeaux wine be used, and this is the kind I have employed, the difference in the discolouration of the wine, whether the oxide of iron be used as directed or not, is so little perceptible, that this part of the process may be omitted.

The preparation of tartrate of protoxide of iron is very simple. It consists in decomposing an equivalent of protosulphate of iron with an equivalent of neutral tartrate of potash, instantly washing the precipitate with water, collecting it on a strainer, pressing it strongly, and drying over a water bath. —*Journ. de Pharm.*

ON THE LAWS WHICH GOVERN THE ELECTRO-CHEMICAL DECOMPOSITION OF BODIES.

BY M. EDMUND BECQUEREL.

The object which I have proposed to myself, in the work which I have the honour of submitting to the Academy, is to make known the laws which govern the electro-chemical composition of bodies.

Faraday had laid it down as a principle that, when the same current was made to traverse several metallic solutions—such as those of nitrate of copper, lead, silver, &c.—equivalent quantities of the metal are deposited at the negative pole in each solution. But this law is true in only very few cases, when its salt is formed of one equivalent of oxide and one equivalent of acid, and does not account for the effects observed in the decomposition of a very great number of combinations.

I will mention, as an example, the hyponitrites of lead, which give, at the negative pole, twice and three times and a half as much lead as the nitrate, with the same current.

I have examined the decomposing action of electricity on series of well analysed bodies; thus I have successively submitted to experiment all the metallic chlorides, the oxides and oxygenized water, the acetates and hyponitrites of lead, &c.

All the results which I have obtained have led me to the following conclusions:—

When a binary or ternary compound is submitted to the decomposing action of electricity, the decomposition always takes place in definite proportions, so that, for one equivalent of electricity employed, an equivalent of the electro-negative element, or at least of the compound which acts the part of an acid in the combination, is carried to the positive pole, and the corresponding quantity of the electro-positive element, or that which acts as base, is carried to the negative pole.

The law may be set forth as follows:—

One equivalent of a combination formed by the union of an equivalent of acid, and a corresponding quantity of base, always requires an equivalent of

electricity in order to be electro-chemically decomposed.

I have called *equivalent of electricity* the quantity of electricity necessary for decomposing an equivalent of water.

These laws relate only to the direct effect of the current, and not to the secondary effects; for there exist certain salts—such as the acetates of lead—which are decomposed only by the reductive action of the hydrogen arising from the decomposition of water, and which always give an equivalent of metal at the negative pole.

If an equivalent of electricity be required for decomposing an equivalent of any combination whatever, it may be admitted that if the two elements—electro-positive and electro-negative—which form the combination, are separated and recombined, they disengage exactly an equivalent of electricity. Hence, with regard to law enunciated above, the following conclusions are deduced, which are *very important in molecular chemistry*:—

1. When an equivalent of a body, either simple or compound, is combined with one or more equivalents of another body, if the first acts the part of an acid in the combination, the disengagement of electricity which results from their chemical action is such that it always produces an equivalent of electricity.

2. If an equivalent of a body—such as oxygen—is already combined with another which acts the part of a base, and if the composition again unites with an equivalent of the first body, that is to say, with oxygen, in order to form a deuto-salt, there is again disengaged, in this second action, an equivalent of electricity. Thus the quantity of electricity disengaged depends only on the body which acts the part of acid in the combination.

In my memoir, inorganic substances alone have been alluded to, because organic substances are, for the most part, non-conductors of electricity, and because, when they do conduct, the secondary effects so disguise the direct effect, that it is very difficult to recognise the definite action of electricity.

The principles which I have laid down represent well all the results obtained as regards the direct effects, so that there exists a constant relation between the chemical theory of equivalents and the decompositions by electricity; it was very important to establish them, for they should serve as a starting point for every electro-chemical theory.

EXPERIMENTS ON THE FATTENING OF GEESE.

BY M. J. PERSOZ.

I procured ten geese of the same age and of equal strength. They were kept without food for about twelve hours, and weighed at that time, in order to establish their respective weights. One of them, No. 10, was immediately bled, and I determined—

	Kil.
1. The weight of the blood equal to . .	0·157
2. That of the fat surrounding the intestines	0·100
3. That of the fat found in the subcutaneous tissue and the other parts of the body	0·210
4. and, finally, the weight of the liver . .	0·061

By means of these data I calculated the respective weight of each of these parts in the nine remaining geese at the time when they were first submitted to nourishment by maize. The numbers resulting from this calculation are given in one of the tables annexed to my memoir (Table C.), opposite to the weight of these same parts given by experiment.

The quantities of maize consumed by these nine geese are expressed in Table A. It will not be observed without surprise that one of then, No. 2, ate as much as 650 grammes per day, which formed nearly one-fifth of its weight.

In order to be able to estimate the quantity of fat formed in them, I weighed them all at stated periods; these weights were taken immediately before the evening meal, which was given twelve hours after that of the morning, and, in order to arrive as near as possible at the exact cypher of the increase, I subtracted from each of the weights the weight of half of the last meal. Thus, for example, the goose No. 1 was weighed on the 4th of December, in the evening; its real weight was 4 kil. ·055; but, as it had eaten in the morning 217 grammes of maize, I adopted the cypher 4 kil. ·055—108 = 3·kil. ·947. By acting thus it appeared to me that I entered, as much as possible, into the conditions in which the geese were found when they were weighed for the first time.

We see in Table B. the interval at which the different mixtures were made (7 days), and the increase which each goose experienced during each period. In column *a* of this same table are given the numbers representing the mean of increase for each day; in column *e* is found the quantity of maize consumed by each goose. The cypher of the increase of the geese, multiplied by 100, having been divided by the quantity of maize employed, the relation existing between the quantity of maize consumed and the increase of the geese may be established in *f*.

In the 10 first columns, *aa*, *bb*, *cc*, *dd*, *ee*, of the Table C. we set forth the calculated quantities of blood, of liver, and of fat, which we suppose to exist in geese not fattened, with the corresponding quantities of blood, liver, and fat found in geese after being fattened. In column *f* are found the numbers representing the quantity of fat which was formed during the alimentation. These numbers were established by subtracting from the whole of the fat collected the quantity considered to exist, already formed, in the lean geese. In column *g* is represented the total augmentation of each of the geese, in order that the cypher of this augmentation may be compared with that which expresses the quantity of fat extracted from each of them (see column *e*). In column *h* figure the quantities of maize consumed by each goose; in column *i* the quantity of fat which this maize represents; finally, in column *k* are found the numbers representing the difference which exists between quantities of fat which were formed by nourishment with maize (column *f*), and the quantity of fat found in the maize, admitting, which really cannot be, that this latter is entirely used by the goose.

By glancing at Table A. it is evident that the geese did not bear the regimen of alimentation above described during the same number of days; that some were obliged to be killed at the end of the 19th day, whilst others could be gavees until the 24th. In this country, all those who are occupied with the fattening of geese agree in stating that a goose cannot be fattened with profit if it is necessary to kill it before 18, or after 24, days' fattening.

From columns *a* and *b* of Table B. it is evident that all the geese increased in weight; but that this increase was slight in the geese Nos. 1 and 5, both of which, in consequence of an unfortunate influence, lost considerably in weight in the space of two days.

	Kil.
The goose No. 1 weighed, on the 14th of December	4·350
And on the 16th it weighed only	3·755
Difference or loss	0·595
The goose No. 5 weighed, on the 18th of December	4·458
And on the 20th it weighed only	4·016
Difference or loss	0·442

On the 24th of December the woman who was charged with the care of my geese informed me that No. 1 must be bled immediately, because, she said, if the gavees be continued, not only would the food not profit it, but also the animal would lose in weight. Being curious to verify this assertion, I continued to treat it as above, and I saw, with the greatest surprise, that on the second day it had lost, as I said above, 0·595 kil.

During this period, which I will call the period of disaggregation, the excrements of this goose were lactescent, and contained, as I found afterwards, much more fat than those of the other geese. It was from this liquid and milky characteristic that the woman had judged it necessary to kill the goose No. 1.

This phenomenon of disaggregation appeared to me so interesting, that I made arrangements for studying it in all its details on the goose No. 5, but the latter stuffed.

I did not fail, at the first opportunity, to examine this fact, which appeared to me worthy of attention.

I should mention that the augmentations which correspond to the last two or three days of alimentation are not strictly accurate, and that, for the most part, they should be regarded as too high, owing to the bad digestion caused by the diseased state of the animal at the latter state of the fattening. Thus, in the digestive apparatus of certain geese, we found from 230 to 250 grammes as well of maize as of pultaceous matters, whilst in the intestines of the goose No. 10, killed before the fattening, there were only 55 grammes of excrementitial matters. By neglecting, therefore, these latter augmentations, and taking account only of those after from 14 to 20 days' alimentation by maize, it is seen that the augmentation, calculated with respect to the nourishment consumed, was always on the decrease, with two or three exceptions.

The numbers expressed in columns *a* and *a'* of the Table C. establish, except for the geese Nos. 1 and 5, that the weight of the blood was almost doubled in all. In the blood which was extracted from the geese fattened by maize considerable changes were found. It was entirely red throughout, and at other times it is of a *pink white*, which is most commonly the case, and at other times it is white, and has the appearance of cream. In the second case it is separated into two substances—the one, red, is deposited under the form of clots; the other, more liquid, has physical properties which render it comparable to milk. This serous part contains only traces of albumen, for, when heated, or treated by nitric acid, it gives only a slight coagulum.

Blood extracted from fattened geese differs also from that of lean geese in the quantity of fat which it contains, and which is easily separated, under the form of an oleaginous liquid, by a simple desiccation of the blood in a stove, and more readily by ether.

As regards the physical properties of the fatty body which is found in the blood of fattened geese, they present much more anology with the fat of maize than with those which are found either on the epiploon or in the subcutaneous tissue; it is this that we hope to be able to demonstrate further on by the comparative study of the chemical properties of these fatty bodies.

Much fat is added to the liver of a goose thus fattened. It is evident, from the comparison of the numbers inscribed in columns *b* and *b'* of the Table C. that the augmentation of the liver was, with two exceptions, from five to six times the original weight of that organ. The livers of Nos. 1 and 5, instead of being close and white, like those of the other seven, were brownish, congested with blood, flaccid, and spongy—presenting, in a word, all the physical characteristics resulting from a reduction of volume, which is explained by the loss which these two geese suffered, and to which the liver was also necessarily subject. We thought we remarked a certain relation between the development of the liver and that of the fat. Now, if this be true, the reverse should also be so, so that the relation which is proved during the assimilation should be maintained during the disaggregation.

That, under this last point of view, our observations may relate to the liver of lean geese, or to that of fat geese, we have always observed that the weight of the liver is about half that of the fat extracted from the intestines, and about one-fourth of the fat dispersed in the other parts of the body of the animal.

	No. 10. Not Fattened kil.	No. 5. Fattened, but which stuffed. kil.	No. 9. Fattened. kil.
Weight of the liver.....	0·062	0·160	0·335
Weight of the fat of the intestines.....	0·100	0·37	0·605
Weight of the fat found in the other parts of the animal.....	0·212	0·762	1·055

However, more importance than they really possess should not be given to these observations concerning the relations which exist between the liver and the fat of a goose, since they are based on only a small number of examples.

By comparing the numbers of column *e'*, which represent the absolute quantity of fat found in the fattened geese, with the numbers given in column *g*, which expresses their increase of weight, it is perceived that these latter, for the Nos. 1, 2, 5, 6, 7, 8, and 9, are inferior to the quantity of fat found. In the geese Nos. 1 and 6 not only is the cypher expressing their absolute increase of weight inferior to that which represents the whole of the fat, but it is also in this same number diminished from the weight of the fat which should be found in the lean goose. I estimate that, if I had been able to establish the real cypher of augmentation of the weight of the fattened geese, the exception which I have just noticed would not have existed, and that in all there would have been a portion of the animal itself which would have participated in some measure in the formation of fat. But this strict estimation was impossible, since, as we have said, there was in many geese undigested food, from which could not be deducted the unknown and undeterminable weight of fœcal matters which they contained when weighed at the commencement of the experiment.

In support of this proposition, that fattened geese are less fleshy than those which have not been fattened, I may state that in estimating the muscular fibre of a lean goose, I found 0·881 kil.; whilst, in estimating that of a fattened goose, I found only 0·798 kil. Now, if this proposition appears to contradict the observations of Professor Liebig, it must, doubtless, be attributed only to the operation mentioned by that celebrated chemist having been performed in quite different conditions from those on which we have formed our own opinion. In the first place, the goose fattened at Giessen weighed only 2 kilogrammes before the experiment, whilst the goose which we fattened weighed at least more than 3 kilogrammes; then it must be considered that the animal had not arrived at the period of increase, and that the maize which it consumed at first served for its development. In the second place, the goose in question, if it had been *gavee*, as is the custom in Alsatia, certainly would not have been able to support this regimen for thirty-six days. Now, the reason of its living so long was that it consumed daily less maize than ours. We see, indeed, that whilst ours consumed, on the average, 494 grammes per day, Liebig's goose consumed on the average only 0·333 kil. We should remark, moreover, that this latter number would express the exact proportion of maize daily consumed by the goose of Giessen, only inasmuch as old maize was used, as we did at Strasburg, the nutritive value of which is much superior to that of maize collected within the year. This fact is so well known in this country, that the old maize sells at from 15 to 16 francs the hectolitre, whilst the hectolitre of new maize sells for only 10 francs 50 centes.

We thought that this well-recognised superiority of old maize over the new, might be explained by the desiccation which maize undergoes during its exposure to the air, which desiccation, having the result of operating the reduction of maize, must increase its nutritive power. But, in order that this explanation may be fully satisfactory, it is necessary that, in adding the numbers expressing, first, the amount of this reduction; second, the interest of capital; and third, the *déchet*, a total be obtained whose cypher, added to that of new maize, would represent nearly the average price of old maize; now, this is not the case, as we shall show.

In order to ascertain the reduction which maize undergoes by exposure to the air, we compared together equal volumes of maize, old and new.

From weighings made in the market of our town, it results that the weight of a hectolitre of old maize varies from . . . . . 72 to 78 kil.
And that of a hectolitre of new maize varies from . . . . . 65 to 73 ,,

Difference . . . . . $\frac{7+5}{2}=6$

Again, by weighing on a smaller scale, I obtained the following results:—

Old maize, of the same quality as that employed for fattening the geese on which we experimented.

	kil.	
Weight of one litre . .	0·767	Mean, kil. 76·73 the hectolitre.
,, ,, . .	0·765	
,, ,, . .	0·770	

New maize, which had just been egrené.

	kil.	
Weight of one litre . .	0·669	Mean, kil. 66·93 the hectolitre.
,, ,, . .	0·664	
,, ,, . .	0·675	

According to these data, we may, without fear of deviating much from truth, estimate at 10 per cent. the loss by desiccation. If, now, the interest of capital be rated at 5 per cent., and the *déchet* at 3 per cent., the total will be 18 per cent. to be added to the price of new maize.

The latter being about	francs 10·50
The interest and loss	,, 1·89
The price of old maize should therefore be only	,, 12·49
Instead of	,, 15·50

This comparison between the adulterated price of old maize and its real price, demonstrates that the preference which is given to it must be due, in great measure, to an unknown cause, or rather quality, inherent in this seed when it arrives at a certain degree of age. Can this quality be connected with the fact which we have noticed, and from which old maize would contain more oil than new maize? It would be temerity on our part to decide this at present. From 100 parts of maize collected in 1842, we extracted 7·850 of oil, and from 100 parts of maize collected in 1843, and *egrené* on the 20th of January, 1844, we obtained 3·400.

If our attention had been sooner turned to this important point, we should have been able to make experiments on maize from the time of reaping, and to repeat our experiments from time to time, in order to ascertain whether, by becoming old, it really does or does not undergo, as well as many fruits and seeds, a kind of maturation having the effect of developing in maize a greater quantity of fatty matters.

If new experiments on this subject justify the isolated fact which we have just related, we should find the explanation of the disagreement which exists between the results obtained at Paris and Giessen, by equally skilful chemists, with respect to the quantity of oil which maize contains.

According to some, maize contains from 7 to 9 per cent. of fat.

According to others, it contains from 1 to 4 per cent.

And some say that it contains none at all.

The numbers inscribed in column *k* show the difference which exists between the weight of fat formed in the goose, and that of the fat contained in the maize consumed, and we prove imperatively that a large quantity of fat should be formed at the expense of the sugar and fecula of maize. But as when a goose which is being fattened digests well, its excrements* contain only bran properly so called, with a certain quantity of fat, it must also be admitted that the fat of maize should, in all probability, contribute to a certain extent, to the fat found in the goose.

On the other hand, if the fatty bodies which are found in the aliments exert on those which are nourished by it a well recognised influence, is this any reason why aliments in which there is no fat should be improper for fattening animals? Experiment has not yet proved this; for it is no answer to the question to say that pigs are fattened with potatoes. Are not either fatty waters or substances containing fat always added to this aliment? If so, nothing is determined in this respect.

The well-established fact of the diminution of albumen in the blood of fat geese, that of the participation which the very matter of the goose seems to have in the formation of fat, makes us think that we may perhaps arrive, by means of pure fecula, mixed with a nitrogenous matter (albumen), at compounding for geese an aliment free from fat. If by these means, which we are going to try, we arrive at nourishing them and fattening them, the question would be definitively settled, and this fact, joined to that of the diminution of albumen in the blood of the fattened geese, would then explain why those who experiment on fattening begin by *increasing* the flesh before *increasing* the fat. If, on the contrary, the result were negative, and if it were proved that a certain quantity of fat were indispensable to the fattening, our observations relative to the greater or smaller quantity of the fatty body which maize contains, according to whether it is old or new, would acquire much interest; for they would explain why old provender is preferable to new for feeding cattle; why, generally, in our country, more quality is recognised in corn *threshed* in January and February; and, finally, why those who cultivate maize leave it in *grappes*, and expose it to the air for a whole year under *hangars* or *toils*.

From what we have said, the goose being regarded as a laboratory in which fat is formed, it will be sufficient to estimate accurately, by means of appropriate apparatus, the gaseous liquid or solid materials, and those which are expelled or extracted, in order to establish a rational theory concerning the formation of fat, and to decide whether the oxygen acts directly or indirectly on fecula or on the sugar, in order to convert into fat these proximate principles.

We may sum up as follows:—

1. That, according to our experiments, the goose, in being fattened, assimilates not only the fat contained in maize, but that it forms a certain quantity at the expense of the starch and sugar of maize; and perhaps, also, by the aid of its own matter, since the quantity of fat formed in it is ordinarily more than double that which is formed in maize.

2. That, after being fattened, a goose contains a quantity of fat superior to the increase of weight which it has undergone.

3. That, during the fattening, the blood of geese changes in composition; that it becomes richer in fat, and that the albumen disappears or is modified.

4. That, finally, there seems to exist a certain relation between the development of the liver and the quantity of fat produced.

* The weight of dried excrements, in our experiments, was from 12 to 15 per cent. of that of maize consumed. 100 parts of dried and finely powdered excrements having been treated by ether, we extracted from them from 9 to 10·8 per cent. of oil.

A NEW AND VERY EFFICACIOUS ASTRINGENT TOPICAL REMEDY.

BY DR. PUTEGNAT.

This remedy, new in human therapeutics, is that of Knaup, which is regarded by many veterinarians as a sovereign remedy against the recent contusions of horses. Dr. Putégnat has employed it with success in sprains; in contusions, with or without wound; in a fracture, with enormous tumefaction and vast effusion of blood; in a case of considerable swelling consecutive to luxation; in erysipelas of the face; in two cases of erysipelas following *mouchetures* practised on œdematous limbs; in a case of incipient whitlow, and in a varicose ulcer.

The following is its exact composition:—

	Parts.
Sulphates of iron, alumina, and potassa	*a a* 500
Hydrochlorate of ammonia . . .	*a a* 30
Oxide of copper	
Sulphate of zinc	

Mix the whole, and fuse at a gentle heat.

Dissolve in 1000 parts of tepid water a piece of this matter of the size of a nut, and soak in the liquor the compresses with which the diseased parts are to be covered.

Ointment of Iodide of Potassium, by Messrs. Smith, Edinburgh.—Potassii iodidi, aquæ, aa ℥j.; axungiæ, ℥j. Dissolve the iodide of potassium in the water, and then mix the solution with the lard.

(From the *Chemist.*)

ON THE OXIDATION OF PROTEIN IN THE ANIMAL ORGANISM. By *Professor Mulder.*—Professor Mulder, after a long investigation, comes to the following conclusions:—The ebullition of albumen or fibrin, in contact with atmospheric air, gives rise to an absorption of oxygen, by the combinations of protein, proportionate to the length of the ebullition, and that, finally, all the fibrin is converted into oxide of protein, which is not the case with albumen. It results that, by the ebullition of meat, for example, protein is converted into two oxides, and is thus no more presented to the organism in nutriment in the state of protein; that in the ingestion of boiled or roasted meat (indeed, the interior of roasted meat undergoes a change analagous to that which ebullition produces), one part of the protein is converted into binoxide, which renders it hard and sparingly soluble. Another part is changed into soluble tritoxide, and both are then absorbed by the digestive tube, no longer in the state of protein, but in that of the oxides of this substance. The tritoxide, or the portion rendered soluble by ebullition, should, therefore, be found in the extract of meat. Now, as albumen does not undergo the same alteration as fibrin, by ebullition, there exists, also, an essential difference between boiled or roasted meat and boiled albumen, employed as aliments.

In inflammation, the blood presents a greater quantity of binoxide and tritoxide of protein, substances which are also obtained by the ebullition of fibrin, and the latter of which is also furnished by the ebullition of albumen. M. Bouchardat found in fibrin a principle which he called epidermose, which is insoluble in dilute hydrochloric acid, and which is probably formed of binoxide of protein. Now, Scherer found that fibrin, in contact with oxygen, absorbs a greater quantity of this gas, and that it is replaced by a smaller quantity of carbonic acid. He observed, moreover, that arterial fibrin, the buffy coating, fibrin obtained by beating up blood, that which was exposed to the air or maintained for a few moments in ebullition, or which was in contact with alcohol (a liquid which contains much oxygen), did not dissolve in the mixture of M. Denis,—a property which belongs to binoxide of protein. Protein gave rise, therefore, in all these experiments, to the formation of a body containing more oxygen than the latter. Now, as we have obtained oxides of protein under the influence of the boiling temperature; as we have separated them in great quantity from the buffy coating; as, moreover, the epidermose of M. Bouchardat, is only binoxide of protein, it results that protein may be further oxidised in the blood; that the albumen of the blood, which furnishes only tritoxide by ebullition, probably takes no part in this alteration, but that it is operated by fibrin only, which absorbs oxygen from the air so slowly, and is converted with so much facility by boiling, into binoxide and tritoxide: it results, moreover, that this more advanced oxidation really takes place in inflammation, and that the two oxides which the blood always presents in great quantity in inflammation should also be constantly found in healthy blood. Both states, the normal and inflammatory, differ only in the quantity of binoxide and tritoxide of protein found in the blood not being the same. Between these two extremes there may, however, be many intermediate states induced indubitably by different diseases.

The protein of the blood, principally fibrin, is, therefore, a conductor of oxygen. Presented to animals in plants in combination with sulphur and phosphorus, dissolved in the *primæ viæ* and poured into man in the left subclavian vein, it should be partially oxidised in the lungs, where it comes in contact with oxygen. This portion takes the form of binoxide of protein (the epidermose of M. Bouchardat). Hæmatin is not, therefore, the sole conductor of oxygen, but protein itself is another. Arterial blood contains, with albumen and the elements of fibrin (that is to say of the substance which unites in filaments in the coagulation of blood), two other principles—binoxide and tritoxide of protein, which are conducted to different parts of the body. The oxygen absorbed in the lungs commences, even in those organs, its action on protein; there circulate in the body other substances besides the sulphuro-phosphuretted combination of protein, and besides fibrin and albumen; these are the degrees of oxydation of protein, produced in the lungs by one of the two bodies, or by both at once, which then give up their oxygen in the capillary system, in order to give rise to chemical alterations in it, and to return in the venous blood a smaller quantity or even no oxyprotein, which is then found to be replaced by new products arising from the capillary system.

There is, therefore, operated in the respiration a true oxidation of the blood, or rather of protein, and in inflammation, in which the blood contains a greater quantity of binoxide and tritoxide than in the healthy state, a higher oxidation of this body really takes place. The ancient opinion respecting inflammation, which was supported by no investigation, and which was even based on incorrect data, is now found confirmed by these experiments, a very singular result; the blood, indeed, contains more oxygen in inflammation.

Hence it occurs that, in the acceleration of the respiratory act, in fevers, for example, inflammation so easily supervenes after violent and sustained efforts. Every fit of fever must necessarily cause the formation of a greater quantity of oxyprotein in the body, and every augmentation in the quantity of oxyprotein must produce an inflammation, which may, in its turn, determine fever. Hence also, it happens that the irritating aliments and drinks which accelerate respiration in a given time, or cold air, which introduces more oxygen into the blood, consequently, give the first impulse to the development of inflammation in the organism. The buffy coating is formed when oxyprotein predominates in the blood, and a partial inflammation is produced when it accumulates in a particular place.

The consequence of this phenomenon is the formation of new products of false membranes, for example, in the serous membranes, induration in other places, products which should be formed of the same substance, as the buffy coating—of oxyprotein.

The deoxygenising substances which may arrive in the blood should, consequently, combat the inflammation.

In the latter there is no more fibrin, but more oxyprotein; this substance is the most important principle of the buffy coating, which gives much tritoxide of protein by gentle boiling with water. Now, the inflammation is combatted by endeavouring to diminish the quantity of this trixotide of protein, and to prevent its formation in the lungs.

In what manner do known antiphlogistic means accomplish either of these two objects? It is not difficult to explain this, now that we have ascertained the nature of inflammation. I shall return to this subject in greater detail at a future period.

Bleeding directly diminishes the quantity of oxyprotein, consequently it exerts an antiphlogistic action; the augmentation of the secretion of the digestive tube, for example, produces a similar effect by accelerating the exchange of substance in the body, and, consequently, also, the consumption of a greater quantity of the oxyprotein the blood. In a word, there exists no opinion concerning the action of an antiphlogistic means which is not in perfect accordance with the presence of oxyprotein in the blood.

If we reflect for a moment on the presence of oxyprotein in healthy arterial blood, we have explained to us the great quantity of oxygen absorbed by the lungs—a quantity which can never be put in comparison with that of hæmatin. This substance exists in much too small proportion for the large quantity of oxygen absorbed in the lungs at each respiration to be attributed to it. Another conductor of oxygen must, at all events, be found in arterial blood; we have found in fibrin (that is to say, in the substance which furnishes fibrin by the coagulation of the blood) the body which fulfils this function. The arterial blood, rich in oxyprotein, penetrates into the different organs, and, whilst the unoxidised protein passes, perhaps without alteration, in the proper organs of secretion, in order to arrive in the venous blood, the oxyprotein of the arterial blood is freed from its oxygen in the secretory organs; hence the oxidation of the substances which exist in the body, and the formation of the carbonic acid of respiration. Do the elements of protein deprived of its oxygen then return by the veins in the state of protein (fibrin or albumen)? This is a question which new investigations and analysis of venous and arterial blood must decide.

If oxyprotein once formed in the lungs, is not again changed into fibrin or albumen in its passage through the body, the unoxidised protein of the organism (fibrin) may serve for the formation of muscular fibre, and the oxidised part for that of the cellular tissue, of chondrine, and of the principles of the corneous system, whilst the lungs and the liver eliminate from the body the residues of the aliment which do not contain protein and oxyprotein, which serve for secretion. All these phenomena merit a more ample development; it is sufficient here to know that oxidised protein exists in the organism under two different forms, in small quantity in healthy blood, and in greater quantity in inflammation.

It now remains to be determined whether the products of the oxidation of protein exist in plants as well as in animals. However, it is more than probable, according to the foregoing investigations, that plants do not contain fibrin.

INVESTIGATIONS CONCERNING THE CARBONATES OF COPPER.* *By M. P. A. Favre.*—The blue solution, thoroughly concentrated, and well saturated with carbonate of ammonia, is diluted with twice its bulk of alcohol; as takes place in the ordinary circumstances of a solution of sesquicarbonate, crystals of bicarbonate are not deposited, and, after twelve hours, the liquid being decanted, the sides of the vessel are covered with large and beautiful crystals, and sometimes with needles not less than five centimetres in length; these crystals have a very intense blue colour, analogous to that of the carbonate of Chessy; they present a purple tint by transmitted light.

Analyses.

					Theory.
Cu O....	50·47†	50·38‡	50·49§	0¶	50·41
H ..	"	"	"	3·97	3·81
H ..	"	"	"	18·20	17·79

Its formula—

$$CuH_3NO,CO_2$$

This salt is a carbonate of oxide of cuprammonium; regarding it in this point of view, $CuOCO^2H^2N$, the ammonia acting the part of water, it would correspond to a carbonate of copper, which is not known, and we should thus arrive at the only possible explanation of the ammoniacal carbonate of zinc, whose analysis I have given, and whose formula, I think, can only be as follows:—$ZnO, CO^2\ ZnH^3NO, CO^2$. This salt is rapidly destroyed by water; in this case, the water takes up carbonate of ammonia, dissolves a portion of carbonate of copper, by aid of this salt, and there remains carbonate of copper 2 CuO, CO^2, 2HO, to which we shall return further on. Water charged with carbonate of ammonia dissolves it without residue; it is therefore impossible, according to what we have just said, to crystallise it in water; it is completely insoluble in alcohol and in ether, and does not undergo any alteration in them. Also, in order to avoid all alteration of the crystals, after having decanted the liquor in which they are formed, and, after having collected them at the bottom of the vessels, they must be washed with alcohol and dried rapidly in the air. Notwithstanding this rapid alteration of the crystals by water, they are formed in abundance in the filter through which the blue liquor has been strained, and on which there remains carbonate of copper and carbonate of ammonia, undissolved; they may also be produced, but in small crystalline grains, by a simple digestion of carbonate of copper, and carbonate of ammonia in alcohol; finally, it may be obtained, but in the pulverulent state, by mixing the cupreous and ammoniacal salts, in the dry state, and submitting them to a temperature of 212° F.; the mixture fuses, loses its water and the excess of ammoniacal salt, then again becomes solid with a beautiful and very intense blue color.

Heat acts on this salt in the following manner:—Heated to 392° F., in a current of carbonic acid, carbonate of ammonia is sublimed; a portion of oxide of copper is reduced. The sublimed carbonate gave the following numbers:—

(¶)	CO^2	51·17
	H^2N	40·29
	HO	8·64

172 cubic centimetres N. temperature 60·8 F., pressure 0m. 7610.

(1)	Matter	1 gr.	131=0·752 Cu O.
	"	1 "	978=0 294 H O.
(2)	"	1 "	082=0·720 Cu O.
(3)	"	2 "	098=1·389 Cu O.
(4)	"	1 "	574=1.040 Cu O.
	"	1 "	378=0·210 H O.
(5)	"	1 "	896=1·262 Cu O.
	,,	1 "	537=0·227 H O.

It is evident that this carbonate is anhydrous, for the water found by analysis is not only not sufficient for forming the hydrated carbonate of ammonia, but also the partial reduction of the carbonate of copper gives it as an accident of the operation, for

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* *Annales de Chimie et de Physique*, Jan. 1844.

carbonate of copper dissolves in sesquicarbonate of ammonia, and the solution is of a beautiful blue; this fact is perfectly known; but what is the combination which is produced? It is indicated only hypothetically. I have obtained a well-crystallised product, whose analysis, and various modes of alteration, I now give.

† 1 gr. 365 of matter gave 0·688 Cu O.
‡ 2 " 400 " 1.208.
§ 1 " 014 " 0·512.
¶ 1 " 008 " 0·361 HO.

158 cubic centimetres N_3, temperature 64° F., pressure 0m. 7584.

(¶) 01 gr. 611 of matter, gave 0·442 of water.

0·371 of the black residue obtained by heat, gave me 0·058 of metallic copper. I ascertained that it was not an amidide. This operation proves, besides the anhydrous state of the salt of copper, how easily the oxide of copper may be reduced at a low temperature by reducing bodies in the nascent state. Submitted rapidly to a more elevated temperature, this salt is decomposed with a vivid deflagration; and if the operation be performed in a current of carbonic acid, the residue of the operation is metallic copper: the oxide of copper was completely reduced. This property requires peculiar precautions during the analysis for estimating either the oxide of copper or the other elements; this salt is slowly altered in the air.

The liquor, from which the crystals were formed, abandoned to the air deposits a crystalline crust of a bluish green. This carbonate possesses the following composition :—

	(1)	(2)	(3)	(4)	(5)	Theory.
Cu O	66·49	66·54	66·20	66·07	66·56	66·66
H O	14·87	"	"	15·23	14·77	15·00

Formula.....2 Cu O, CO^2 2 HO

The oxide of copper arising from the calcination is brilliant and in crystalline laminæ. It is, therefore, the green carbonate analysed by Berzelius, plus 1 equivalent of water. Moreover, by precipitating the carbonate of copper without heat, as that chemist has observed, this salt is blue, and differs from the green obtained by heat only in the greater quantity of water. I wished to ascertain whether the quantity of water in excess could be well defined; for that purpose I precipitated, without heat, some carbonate of copper, which I washed without heat and placed on two filters; the one, humid, was submitted to a sand-bath heat, and rapidly passed from blue to pear-green, becoming pulverulent. Analysis gave the numbers of Berzelius. The other, compressed, was dried in the air, and remained blue; afterwards dried at a temperature of from 122° to 140° F., the analysis gave me 61·86, 63·18, and 62·39 per cent. of oxyde of copper; these numbers approach those given by the formula 2 Cu O CO^2 3 HO. Dried at 230° F., it again loses water, and the following analysis gives it the formula 2 Cu O CO^2 2 HO.

	(1)	(2)	(3)	Theory.
Cu O	66·72	66·45	67·12	66·66
H O	15·08	14·89	14·92	15·00

It therefore appears well demonstrated that the carbonate of copper precipitated without heat, dried in the air, presents a very stable constitution, whilst it is sufficient, in presence of water of the temperature of 194° F., to make it lose 1 equivalent of water; but, dried and submitted to 230° F., it keeps this equivalent, and loses it, as we shall see farther on, only by losing carbonic acid.

If we dilute with a greater quantity of water the same blue liquor which deposited the crystals of ammoniacal carbonate of copper, a blue salt is precipitated, which presents a very different composition; it is blue from the time of its precipitation, and when it is simply dried in the air from 122° to 140° F., it seems to contain more water than when it is dried at 230° F.; indeed, for the four different products I obtained:—First, 70·35 Cu O, 13·05 CO^2; second, 68·91 Cu O, 12·54 CO^2; third, 72·62; fourth, 69·6. These numbers agree very well with the formula 3 Cu O CO_2 3 HO; but dried at 230° F., it acquires the green tint of acetate of copper, and its composition is constant. The following numbers lead to the formula 3 Cu O CO^2 2 HO.

	(1)*	(2)*	(3)*	(4)*	Theory.
Cu O	75·76	75·08	75·51	74·98	75·00
HO	12·98	"	11·30	11·34	11·25

This salt has therefore the same formula as that of the carbonate of Chessy :—

3 Cu O 2 CO^2 HO
3 Cu O 2 HO CO^2

The water replacing the carbonic acid, and *vice versâ*.

Action of heat on the Hydrates and Carbonates of Copper.—I have analysed all the products which I submitted to the action of heat; they are the following :—

		Decomposed at.
Cu O HO	Hydrate of copper	302° F.
2 Cu O CO_2 HO	Pear-green carbonate	356° F.
	malachite	518° F.
2 Cu O CO^2 2HO		366° F.
2 Cu O CO^2 2HO		230° F. loses HO
3 Cu O 2CO^2 HO	Blue ash	410° F.
	Chessy	518° F. loses HO
3 Cu O2 HO $CO2$		331° F.
3 Cu O3 HO CO_2		230° F. loses HO

According to this table, it is evident that the presence of water lowers the point of decomposition of the salts; but the departure of water is always accompanied with that of the carbonic acid, for each of these products, analysed in different phases of their decomposition, has always shown the constancy of this simultaneous departure. Water and carbonic acid differ, therefore, very little in their power of affinity in presence of oxyde of copper. It is evident, moreover, that the artificial carbonates present less stability. If, now, we seek to account for this multiplicity of the carbonates of copper, it will be easily explained when we take into consideration the very feeble affinities of their constituent elements. The oxide of copper on one hand, and on the other especially, the carbonic acid and water, which, from their almost equal affinity, require only very feeble variable circumstances to partake differently the base of which is delivered to this affinity. If, again, we regard the ammoniacal carbonates, we shall find many more of them, and this seems to be easily explained; for the latter, the conditions are more favourable; for, besides the solvents at a favourable temperature, and of a different nature, in which they may be produced, conditions attainable for the carbonates of copper, their solubility and the volability of all their elements present new facilities for the production of more numerous compounds. It is based on this resemblance that I consider these investigations as possessing some interest.

A Few Words on Pectic Acid.* *By Fromberg.*—Fromberg has adopted, from analytical investigations, the following formula for the composition of pectic acid :—

	Calculated.
C^{12}	45·48
H^{16}	4·95
O^{10}	49·57

He thinks that the quantities of carbon found by MM. Frémy and Regnault are too small, and that the formula C^{24} H^{34} O^{22}, deduced from their analysis, is not correct.

His investigations have, however, in general, confirmed the observations of M. Frémy relative to the alterations which pectic acid undergoes by boiling the water, and by the action of acids and alkalies. He has found, more than once, after prolonged boiling with a feebly alkaline liquor, that no precipitate was formed by the addition of an acid: metapectic acid, which is soluble in the acids, was produced.

Fromberg announces that he is engaged with investigations concerning this modfication of pectic acid, which Frémy has called matapectic acid, as well as concerning the other alterations which pectic acid undergoes in different circumstances. He proposes to publish them at a future period.

On the Appropriation or Distribution of Lands. *By Professor Liebig.*†—How is it possible, it may be asked, that there could ever be any doubt as to the part which the soil and its principles perform in the development of vegetables? or that the mineral principles of the plant could ever be regarded as neither necessary nor essential?

There has also been observed on the surface of the earth the same circulation, a continual exchange, a perpetual disturbance and restitution of equilibrium. The observations in agriculture show that the augmentation of vegetable substances, on a given surface, increases with the introduction of certain bodies which *were originally principles of the same surface of land*, which the plant has removed from it; the excrements of man and animals proceed from plants; and these are precisely the substances which in the vital act of the animal or after its death, resume the form which they possessed as principles of the soil.

We know that the atmosphere contains none of these substances, and that it cannot restore them; we know that their abstraction from the soil entails an inequality of production, a want of fertility; and that we can, by the addition of these substances, re-establish and increase fertility.

After such numerous and striking proofs relative to the origin of the principles of animals and plants, to the utility of the alkalis, of the phosphates, and of lime, can the slightest doubt exist as to the fundamental principles of rational agriculture?

In fact, has the art of agriculture any other basis than the re-establishment of the disturbed equilibrium?

Can it be imagined that a rich and fertile country, possessing a flourishing commerce, which for ages has exported the products of its soil under the form of cattle and corn, can retain its fertility, if the same commerce do not return to it, under the form of manure, the principles removed from its fields, and which the atmosphere cannot replace? Would not such a country suffer the same fate as the lands, formerly so rich and fertile, of Virginia, where neither wheat nor tobacco can any longer be cultivated?

The large towns of England consume the products of English agriculture, and, besides, that of foreign countries. But the principles of the soil indispensable to the plant, and which are derived from an immense surface of land, are not returned to the soil. Regulations which have their source in the manners and customs of this people, and which are peculiar to this country, render it difficult, and, perhaps, impossible, to collect the immense quantity of phosphates (the most important of the mineral principles of the soil, although their proportion in it is very small), which are daily conducted into the rivers under the forms of urine and solid excrements.

We have seen the English fields thus exhausted of phosphates present a very remarkable case; we have seen the exportation of bones (phosphate of lime) from the Continent double their product, as by enchantment.

But the exportation of these bones, if it continue on the same scale, cannot fail gradually to exhaust the soil of Germany; the loss is so much the greater as a single pound of bones contains as much phosphoric acid as a *quintal* of cereals.

The Thames, and the other rivers of Great Britain, carry away every year thousands of quintals of phosphates.

Thousands of quintals of the same substances which come from the sea are returned into the country, in the form of guano.

The imperfect knowledge of the nature and properties of matter gave rise, in the days of alchemy, to the opinion that the metals proceeded from a seed. The crystals and their ramifications were regarded as the leaves and branches of the plant-metal, and all efforts tended to find the seed and and the earth appropriated to its development. Without giving anything in appearance to an ordinary vegetable seed, it was considered to produce, by its development, a stem, and a trunk bearing flowers which produced other seeds. If the seed-metal had been possessed, similar hopes might have been entertained.

These ideas could arise only in a time when the knowledge of the atmosphere was next to nothing, when the part which the earth and air take in the vital acts of plants and animals was unknown.

The chemistry of the present day prepares the elements of water, composes this water with all its properties by aid of these elements, but it cannot create them; it can only extract them from water. The artificial water has been water before.

Many of our agriculturists resemble the ancient alchemists. If the latter sought for the philosopher's stone, the former seek for the wonderful seed which, without the addition of nourishment to their soil, scarcely sufficiently rich for indigenous plants, should produce a hundred-fold.

The observations made for ages, for thousands of years, cannot preserve them from the illusions always arising. The knowledge of true scientific principles alone can give the power of resisting such errors.

In the earliest age of natural philosophy, it was water alone that developed organic substances; then, it was water and certain principles of the air; now, we know with the greatest certainty that it is necessary to add other principal conditions furnished by the earth, to the latter two, in order that the plant may have the power of being reproduced and multiplied.

The quantity of aliments of plants contained in the atmosphere is limited; but it should be quite sufficient for covering the whole surface of the earth with a rich vegetation.

Let us consider that under the tropics, and in the

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(1) Matter 1 gr. 802=1·202 Cu O.
" 1 " 412=0·213 H O.
(2) " 2 " 101=1·326 Cu O.
(3) " 1 " 857=0·277 H O.
" 1 " 771=1·188 Cu O.
" 1 " 251=0·117 H O.
(1)* Matter 2 gr. 111=1·599 Cu O.
" 1 " 443=0·200 H. O.
(2)* " 1 " 752=1·315 Cu O.
(3)* " 2 " 112=1·595 Cu O.
" 3 " 213=0·363 H. O.
(4)* " 2 " 198=1·648 Cu O.
" 1 " 351=0·153 H O.

* *Annalen der Chemie und Pharmacie*, Vol. xlviii.

† *Annalen der Chemie und Pharmacie.*

countries of the earth where the most general conditions of fertility, moisture, an appropriate soil, light and an elevated temperature, are united, that in these places vegetation is scarcely limited by space, that when the soil is inefficient, the plant, dying, itself with its bark and branches become a part of the soil. It is clear that the plants of these countries cannot be deficient in atmospheric aliment; neither are our cultivated plants deficient.

It is the continual motion of the atmosphere that furnishes to all plants an equal quantity of the aeriform aliments necessary to their development. The air at the tropics does not contain more than the air at the torrid zones; and yet, what a difference is shown in the power of the production of equal surfaces of land in these different countries!

All plants of the tropical regions, the wax and oils, palms and the sugar-cane, contain, compared with our cultivated plants, only a small quantity of the principles of the blood, properly so called, necessary for the nourishment of the animal. The tubercles of the Chili potato, which resembles a high shrub, gathered from a whole acre of land, would scarcely suffice for one day for the sustenance of an Irish family (Darwin). The plants which serve for nourishment, and which form the object of culture, are only intermedia for the production of these principles of the blood. In the absence of the elements which the soils should furnish for their production, wood, sugar, and starch may, perhaps, be formed in the plant, but it is not the same with the principles of the blood. If we wish to produce more of them on a given surface, than the plant in the free, natural, normal state, on this surface, can derive from the atmosphere, or receive from the soil, an artificial atmosphere must be created; the principles which are deficient must be added to the soil.

The nourishment which should be furnished to different plants, in a given time, in order to allow of free and uninterrupted development, is very unequal.

On arid sand, on a pure calcareous soil, and on naked rocks, but few kinds of vegetables grow; these are only vivaceous vegetables; only very small quantities of mineral substances are required for their slow growth, which the soil, sterile for other kinds of plants, may still furnish to them in sufficient quantity: annual plants, especially those of summer, grow and attain their complete developement in a proportionally short time; they do not thrive on a soil which is poor in the mineral substances necessary to their development.

In order to arrive at a maximum of size, in the short period assigned to their life, the nourishment contained in the atmosphere is not sufficient. In order to attain the objects of culture, it is necessary to create for them, in the very soil, an artificial atmosphere of carbonic acid and ammonia. This excess of nourishment, which is wanting to the leaves, must be furnished to the organs contained in the soil, which correspond to them.

But ammonia and carbonic acid are not sufficient for producing a principle of the plant, an alimentary substance for the animal. The formation of albumen is not possible without the alkalis, nor can vegetable fibrin and casein be produced without phosphoric acid and earthy salts. We know that the phosphoric acid of the phosphate of lime, which is separated in great quantity under the excrementitial form in the barks of ligneous plants, is indispensable to our cereal and leguminous plants for the formation of their seeds.

What a difference between summer plants and evergreens, fatty plants, mosses, trees with acicular leaves, and the ferns! Summer and winter these latter plants assimilate every moment of the day carbon, by means of their leaves, by the absorption of carbonic acid, which the sterile soil cannot furnish to them. Their coriaceous or fleshy leaves retain the water absorbed with great force, and lose by evaporation very little of it compared with other plants.

How small, indeed, is the quantity of mineral substances which they remove from the ground in the whole course of the year, during the almost uninterrupted duration of their growth, if we compare it with the quantity which a crop of wheat of equal weight, for example, takes from the soil in three months!

From the foregoing it results that the advantages of appropriations are based on the fact that cultivated plants remove from the soil unequal quantities of certain ailments. In a fertile soil the plants should find all the inorganic principles indispensable to their developement, in sufficient quantity, and in a state which allows of their being absorbed by the plant.

A field prepared by art contains a certain amount of these principles, as well as of the vegetable substances in putrefaction and ammoniacal salts. We make succeed to a plant containing potassa (turnips and potatoes), a plant containing silica, and to the latter a plant containing lime.

All these plants require alkalis and phosphates: a plant containing potassa requires the greatest quantity of the former, and the smallest quantity of the latter. The plant containing silica requires, with the soluble silicic acid which the plant containing potassa leaves, a considerable quantity of phosphates. The plant containing lime, which follows (peas, clover, &c.), may so exhaust the soil of this important principle, that there does not remain more of it than is sufficient for permitting the formation of the seed of a crop of oats or rye.

The number of the crops obtained depends on the quantity of alkaline silicates and phosphates, or of the calcareous and magnesian salts which are found in them.

The provisions of these salts may suffice for two crops of a plant containing potassa, or lime, for three or more crops of a plant containing silica, and even for five or seven crops; but, after this time, all the mineral substances which we have taken from the soil, under the form of fruit, stems, leaves, and straw, must have been removed: the equilibrium must be re-established, in order that the land may recover its primitive fertility.

This is effected by *manure*.

It may be admitted that (in the roots and the stubble of cereal plants, in the fallen leaves of ligneous plants) the soil recovers as much carbon as it received at the commencement of vegetation, under the form of carbonic acid, produced by the destruction of humus. The stalks and leaves of potatoes, and the roots of clover, remain in the ground. These remains putrefy, and are destroyed during the winter, and the young plant and the seed find in them a natural source of carbonic acid. The soil is not exhausted of humus by these plants.

Finally, it may be concluded, from theoretical reasons, that the soil receives from plants, during their life, quite as much, or even more, of matters rich in carbon than it furnishes to them; that an act of excretion, which is operated at the surface of the fibres of the roots, enriches it with substances which putrefaction, during the winter, again converts into humus.

The existence of an act of secretion and excretion has been maintained by some physiologists, and denied by others, so that at present the opinions on this point are divided. No one doubts, however, that the oxygen which separates from the leaves and green parts, is an excrement. The vital activity of the plant assimilates in its organs the carbon of the carbonic acid, the hydrogen of the water, whilst the unassimilated oxygen is separated.

We have in flowers volatile oils, combinations rich in carbon and hydrogen, which have, likewise, ceased to belong to other vital acts. We see exude from the bark, resins, balsams, and gum; from the leaves, and from their hair sugar and mucilaginous matters.

On the surface of the barks, roots, and all parts of plants which are not green, oxygen is not separated. We observe then, on the contrary, the separation of substances rich in carbon which, produced in the vital act of the plant, have undergone no alteration. If we compare, for example, the bark of fir, of pines, of the beach, of oak, of hazel-tree, and wood, we find essential differences in their properties and composition.

Whilst wood, properly so called, leaves only $\frac{1}{2}$ to 2 per cent. ash, the bark of the oak, the fir, the willow, and the beach, gives 6·10, and even 15, per cent.; the ash of the wood and that of the bark have a very different composition. The inorganic principles of the bark are evidently substances which the living organism has rejected. A similar origin should be admitted for the organic principles of the bark. That of cork contains nearly half its weight of fatty substances or analogous matters, which we find, but in smaller proportion, in the barks of the fir and pine. The solid principle of these barks, insoluble in alcohol or ether, is perfectly different from the substance of wood. The barks of fir and oak almost completely dissolve in a solution of potassa, forming a liquor of a deep brown colour, from which the acids precipitate a matter which has the greatest resemblance to the substance called ulmic acid. Wood is not attacked by a solution of potassa.

These barks are true excrementitial substances, since they arise from the living plant, and no longer take any part in its vital functions. They may be removed from the plant without putting its existence in danger. It is known that most of the plantains are annually deprived of their bark. Taking, therefore, this fact in its true signification, it is evident that there are formed in this ligneous plant, by aid of certain combinations produced in its vital act, substances which, not having to undergo any further change, are eliminated.

We have every reason to believe that this elimination takes place all over the surface: we observe it not only on the trunk, but also on the smaller branches; and we should conclude that this act of excretion is operated also in the roots.

We see that rain-water, in which a branch of willow vegetates, is gradually colored of a deep brown. We observe the same phenomenon with bulbous plants (hyacinths), which are grown in pure water. It cannot therefore be denied that there is an elimination of excrementitial substances in plants, although it may not take place to the same extent in all.

The enriching of the soil with organic substances by the culture of vivaceous plants, such as the *espacette* and the clover, which are distinguished by the abundant ramifications of their roots, as well as by the great development of their leaves, is considered as a positive fact by most agricultural writers, and which is perhaps explained in the preceding.

We cannot operate the formation of ammonia on cultivated lands, but indeed an artificial production of humus. It is the latter which should be considered as one of the objects of appropriations, and as a second cause of their advantages.

It is by sowing a field with clover, rye, lupins, sarrasins, &c., and by incorporating in the ground plants ready to flower, by tillage, that we create in consequence of an act of destruction of the new-sown seed and of the young plant which is developed, a maximum of nourishment, an atmosphere of carbonic acid: all the nitrogen which the first plant took from the air—all the alkalis and phosphates which it received from the soil, serve to render more beautiful and more luxuriant the vegetation of the plant which follows.

LIQUOR OPII SEDATIVUS. *By A. J. Cooley.*—It is a matter of considerable inconvenience to the medical practitioner, and often of serious injury to both himself and patients, that such a variety of liquid preparations of opium should be sold under the above name. Many of these, which have come under my notice, in the last few years, have varied so sensibly in quality and even in appearance, as to lead me to a further examination of the matter. In some cases the article resembled a *weak tincture* of opium; in others a *vinum opii*; but more generally an *acetum opii*, to which, in almost every case, spirit had been added. Some samples were very improperly named *sedative*, possessing equally narcotic properties with the common tincture of the shops.

This difference in quality and composition will scarcely appear singular, when we consider the variety of opinions which appear to exist relative to the original preparation. The general belief appears to be (with only two or three exceptions, and those of a very recent date), that the L. O. S. of Battley* is a solution of "*impure* acetate of morphia," or in other words, an acetum opii.

In illustration I will quote Dr. Paris, who says, in his Pharmacologia, page 621—

"Under this name, Mr. Battley, a manufacturing druggist, of Fore-street, London, has offered for sale a narcotic preparation, which is generally supposed to owe its efficacy to the acetate of morphia."

Dr. Thomson, in his New Dispensatory (10th edition, 1844), remarks—

"There is some reason for thinking that another preparation of opium, the Liquor Opii Sedativus of Mr. Battley, of Fore-street, London, which has justly been esteemed an excellent preparation of the drug, owes some of its efficacy to the acetate of morphia, if it be not a simple, impure solution of the bimeconiate."

Other quotations of a similar nature might easily be made; but these may be well superseded by reference to the various formulæ, which have from time to time been recommended to produce either substitutes or imitations of this "excellent preparation."

Going back then to Dr. Paris, I may mention the formula of Messrs. Macqucen and Baker, to which 20 lines of close print are consigned in the Pharmacologia, and which concludes with the following strong language:—

"The profession ought to feel deeply indebted to these manufacturing chemists, who, quitting the usual routine, take pains to observe and to reason on what they observe."

The process is—

* I wish it to be distinctly understood that Battley's Liquor Opii Sedativus is the article alluded to throughout this paper; *other preparations*, though possessing similar properties and called by the same name, not being (knowingly) admitted as such by the medical profession, or allowed to be substituted for it in dispensing.

Triturate Turkey opium with several portions of cold distilled vinegar, filter, evaporate to an extract, dissolve again in distilled vinegar, filter, and again evaporate. Dissolve in proof spirit, set aside for one week, then filter.

Haden, in his Translation of Magendie's Formulary, recommends the "dregs left from making tincture of opium, to be macerated in a dilute solution of tartaric acid."

Mr. Horne's formula is:—

"Three times the quantity of the best opium that is ordered in the Pharmacopœia for two pints of tincture to be reduced to fine powder, and added to two pints of dilute acetic acid. After they have been digested for a few hours, add six or eight pints of rectified spirit of wine, macerate for seven days, filter, introduce the liquor into a retort, and draw off the spirit. The liquor in the retort is the Acetum Opii Sedativus."

In a publication contemporaneous with THE CHEMIST, several pages were lately devoted to the subject, and the following formula proposed:—

R. Acetous extract of opium, 1½ ounces, or hard opium, in powder, 3 ounces, distilled water, 1½ pints, rectified spirit, 10 fluid ounces; dissolve and filter.

Messrs. Smith, of Edinburgh (CHEMIST, vol. ii., page 284), propose a method of forming a solution of opium, of purely sedative properties, so far as absence of narcotine goes‡; but, as it has been justly remarked, that, like their plan for making iodide of potassium, lately published in the *Pharmaceutical Journal*, it is much too tedious and complicated for any useful purpose. Other authorities might be adduced, who recommend formulæ for the production of sedative solutions of opium, intended either as imitations, or substitutes for Battley's L. O. S., but I will content myself with two, whose views coincide with my own.

Dr. Pereira (*Therapeutics and Materia Medica*, 2nd edition, p. 1772) says,—

"Mr. Battley, some years since, assured me that the only ingredients used in the preparation of his Liquor Opii Sedativus, were *opium, water, and heat*. It appears to contain less meconic acid than the ordinary tincture of opium. Probably this and some of the principles of opium, are got rid of by successive evaporations and solutions. Perhaps an aqueous solution of the watery extract of opium, with the addition of a little spirit to preserve it, would be a convenient substitute."

In page 90 of a useful little work, "The Pocket Formulary," similar language is employed. The general opinion is, however, as I have previously stated. In several conversations I have had with members of the medical profession, I find this to be particularly the case. In one instance I asked, "But WHY, sir, do you suppose Battley's L. O. S. to be an impure acetate of morphia?" To which the gentleman very testily replied — "*Suppose!* sir; why there is *no supposition* in the case! Men of eminence in the profession, who know much more about these matters than either of *us*, are satisfied on the subject." And, in fact, my friend appeared *perfectly satisfied*, although I must be candid enough to say that his feelings were not participated in by myself. I recommend those who entertain the above opinion to examine for themselves. Let them sacrifice a small quantity of the article in actual experiments, and thus settle the account with their consciences, ere they offer any preparation of their own manufacture for sale or exhibition. This is the more necessary, from at least four fifths of the L. O. S. now sold being manufactured by other wholesale druggists than Mr. Battley. In fact, every house has its particular formula, which is esteemed a most important secret. The reason of the latter can only be, that they doubt its *correctness* and *honesty*. This will continue to be the case, so long as Mr. Battley chooses to charge the *foolishly high price* of between twenty and thirty shillings a pound for his nostrum. Did Mr. B. charge a *reasonably remunerating price* only, the inducements offered from cheapness to buy away from him, would immediately cease, and consequently the spurious manufacture.

The examination for acetic acid is easily conducted, by parties even but slightly acquainted with chemical manipulation. If acetic acid be absent, then must the preparation be—neither a solution of impure acetate of morphia, nor an acetum opii. From my own experiments (made on a sample procured at Mr. Battley's warehouse) I have satisfied myself of the following particulars:—

That it contains less meconic acid, resin, and extractive matter, than opium; that it contains scarcely a trace of narcotine, and no fatty matter or caoutchouc; that it contains but a small portion of spirit; that the peculiar smell it possesses is that imparted to an infusion of opium in water by the action of heat; and lastly, that it is a solution of impure meconate of morphia, combined with such other vegetable extractive matter as is soluble in temperate distilled water; the peculiar differences in color, taste, &c., being such as are produced by the after application of heat. These results coincide with the opinions of Dr. Pereira just quoted, and, with some little alterations, his suggestions may be followed.

Either of the following formulæ will produce—not an imitation or substitute, but—the *Liquor Opii Sedativus* itself.

I.

Take dry opium (Smyrna) in powder 1 part
Clean washed (silica) sand.... 2 ,,

Mix, and moisten with water; put the mass into a suitable percolator, and pass distilled water at 65° or 70° Fahrenheit, through the ingredients, until it passes both tasteless and colorless. Evaporate the liquor (by steam or water bath) to the consistence of a *hard pill extract*. Then take of this

Hard extract ..... 3 oz.
Distilled water ..... 30 ,,

Boil for two minutes; let it cool; filter; then add

Rectified spirit..... 6 oz.
Distilled water ..... q. s.

to make up 40 fluid ounces, or exactly one quart.

To those who are inexpert in using the percolator, the following plan will prove more convenient:—

II.

Take Turkey opium (Smyrna), 6 ounces; tear it into small pieces, and macerate in ½ a gallon or less of distilled water, at 65°, for twelve hours; strain with expression, and repeat the process until the opium is exhausted, filter the mixed liquors, evaporate as before to about thirty ounces; let it stand until the next day, filter, and add

Rectified spirit..... 6 ounces
Distilled water..... q. s.

to make up one quart measure (exact).

III.

Take ext. opii (P.L.) ..... 4 ounces
Distilled water ..... 40 do

Boil till reduced to 34 ounces; then add rectified spirit..... 6 ounces.

Let the product be exactly 40 ounces.

N.B.—This article should not be filtered until *quite* cold, and this had better be done in a *cold* place, as, if otherwise, it is apt to lose its brightness on a change of temperature. One or two cloves (at the most) per pint, added to the store bottle, will make it *keep well*, without the least symptom of change. Should the situation be very warm, an ounce or two more spirit may be added after the last filtration, using less water. The above quantity of cloves is quite insufficient to impart a *flavour*. I frequently make it myself, without any spirit whatever, for immediate use.

MILAN PLASTERS.* *By M. E. Soubeiran.*—

		Grammes.
℞	Resin of elemi Liquid stora }	125
	Yellow wax	150
	Camphor	30
	Cantharides in fine powder ..	250

The resin and the wax are melted together, and the storax is added, then the cantharides, and the whole is kept on a very gentle fire for half an hour; at the end of this time it is removed from the fire, and the plastic mass is agitated with a spatula until nearly cold, and the camphor is then incorporated. This plaster is of good consistence, and promptly and surely produces vesication. The milan plasters are most frequently prepared on black taffety.

This formula was communicated to me by M. Louradour. The following is one for which I am indebted to the kindness of M. Ménier:—

		Grammes.
℞	Burgundy pitch	1,500
	Resin of elemi	300
	Galipot	400
	Liquid storax.....	700
	Yellow wax	700
	Powder of cantharides.....	1,400
	Powdered camphor	160
	Essence of lavender	6

F. S. A.

M. Monchon has also published a formula, which I have given in my *Traité de Pharmacie*, and which is very good. It is as follows:—

		Grammes.
℞	Resin pitch	250
	Yellow wax	250
	Lard	250
	Powder of cantharides.....	250
	Turpentine	64
	Essence of lavender	4
	Essence of thyme.....	4

F. S. A.

This plastic composition is spread on black taffety. It is employed as a derivative against fluxions, pains in the head and eyes, and rheumatism; one or two plasters are applied to the place, and covered with a compress. They are removed only when they cease to produce a secretion of serosity, and when they detach themselves they are renewed when wanted.

POISONING BY THE LOLIUM TEMULENTUM, WITH THE MEANS OF DETECTING THIS SEED WHEN MIXED WITH WHEAT FLOUR.* *By Giovanni Ruspini.*—The author was charged with the analysis of some bread which had rendered ill twenty women employed in a silk manufactory. These women, after having eaten it, were seized with somnolency, with an universal convulsive tremor, accompanied by coldness of the extremities.

When this bread was presented to him it was grey, compact, heavy, and of a disagreeable odour, and reminded the author of the examples of adulteration by means of alum or sulphate of copper with wheat flour; but he did not find the characters which these salts present. He then thought of the lime and of the arsenic which agriculturists employ in the operation of liming; then he proceeded to analysis, and he found in the bread a greater quantity of lime than is ordinarily met with, which he attributed to the water used in its preparation. He then asked for a sample of the flour, thinking that it might contain some organic principle which might have been altered or disguised by the action of fire; but he experienced considerable delay in procuring it, and in the meantime the manager of the manufactory in which the women were employed went to the baker, and, after reproaches and threats, obtained from him the avowal that the miller had sometimes furnished to him flour containing lolium. The physician, thinking that he recognised the symptoms of poisoning caused by this substance, administered emetic and emulsions, and all the symptoms were soon dissipated. The affair rested here. However, says M. Ruspini, in my quality of pharmacien, although I was no longer professionally engaged to make investigations relative to the case, I immediately began to make experiments in order to distinguish pure wheat flour from that mixed with lolium. My method of analysis is simple, and capable of being put in practice by persons unacquainted with science. It consists in digesting for half an hour alcohol at 35° at the ordinary temperature, with half an ounce of wheat flour; the more pure it is the more limpid will the alcohol remain; then it will take only a more or less deep straw colour, according as the flour contains more or less of the pericarp and embryo passed through the sieve, owing to the carelessness or design of the miller. The alcohol will be coloured yellow by dissolving the peculiar resin which the *Triticum hybernum* contains, and which resides in the pericarp. The taste of the alcohol thus coloured will not, however, be disagreeable; it will even be rather sweet. If, on the contrary, alcohol be digested with flour mixed with the seeds of the lolium, the spirit of wine will immediately acquire a characteristic greenish tint, which will gradually become deeper; the taste of the tincture will be astringent and disagreeable to the extent of exciting vomiting. Evaporated to dryness in a porcelain capsule, it will give as a product a greenish yellow resin, possessing the same characters as the tincture, but more powerful, and so evident as to leave no doubt as to the adulteration in question.

Some reflections follow concerning the infamy of such a fraud, and the necessity of punishing it, by publishing the names of the bakers who allow it, in the public journals.

In a note, the author says that the arsenic used in the liming is decomposed by the earth, and that the plant cannot preserve any trace of it.

In a second note, he announces that this year, the rains having been very abundant, before the putting forth of the ears, all the *bad* herbs, particularly the lolium, grew abundantly in the fields, rendering it necessary to sift the corn with much care.

ANALYSIS OF THE BLOOD IN A CASE OF LEAD COLIC.† *By Professor Pozzi.*—Having been charged with the analysis of a certain quantity of blood, taken from a subject attacked with lead colic, Professor Cozzi sought to ascertain whether this liquid contained salts or oxides of lead, and whether these substances were combined with all the proximate principles of the blood, or only with some of them.

He detected the presence of a salt and an oxide of this metal, and he found, moreover, that, instead of being combined with the hæmatosin, the periglobule and the fibrin, they entered into combination with the albumen.

* *Journal de Pharmacie*, Feb. 1844.

* *Journal de Chimie Médicale*, Feb. 1844.
† *Giornale per Sereireai Progressi.*

This analysis, which supports the theories already published by Schuebler, Berzelius, Lassaigne and Taddei, is the first by which we have been made acquainted with which of the proximate principles of the blood lead really enters into combination.

[The analyses which we made with M. Brichetau, of the urine of white lead makers attacked with lead colic, showed that these urines contained salts of lead.—A. CHEVALLIER.]

ON THE DIGESTION OF THE HERBIVORA.* *By MM. Prevost and Morin.*—The investigations which we detail in this memoir have for their object the determination of the state in which the alimentary substances prepared in the simple or compound stomach of the herbivora, are delivered to the action of the intestines.

We set out with the idea, that, in ruminating animals, the caseous or albuminous matters of plants are dissolved by the alkali arising from the salivary glands, perhaps excreted also by the first and second stomachs; that after having been expressed from the masticated mass into the third stomach, they are precipitated by the free hydrochloric acid of the stomach; that they are deposited on the surface of this stomach, and are afterwards passed in the form of emulsion by the bile into the small intestine. The nutritive matters of vegetables, extracted in the first stomach, then separated by precipitation in the fourth stomach, would form pure chyme, which isolated by this means from other substances useless to alimentation, would be again taken up by the bile, half dissolved by it, and delivered by its intermedium to the action of the absorbent vessels of the intestines. This mode of view was based on various observations: the uniform alkalinity of the liquid expressed from the alimentary substances contained in the first stomach; the well-ascertained acidity of that of the fourth; and the very ordinary presence of a white, glairy or almost membranous matter on the sides of the latter organ.

The same considerations apply to the herbivora furnished with a single stomach; only these different actions are concentrated or combined in a single apparatus.

Our experiments were made on sheep and rabbits, in order to make a parallel study of the progress of digestion in these two orders of herbivorous mammalia.

SHEEP.

The first stomach of a sheep contained an herbaceous mixture, giving out an excrementitious odour, which furnished, by pressure, nearly five pints of a greenish liquid, having the appearance of an emulsion, and whose surface was almost immediately covered with an iris-colored pellicle. This liquor soon returned the blue color of litmus. The sides of the first stomach feebly re-acted in the same manner. Alkali, therefore, was present.

The third stomach contained only expressed vegetable matters. These matters did not present any very evident re-action, but it was rather acid.

The fourth stomach contained a liquid mixed with some parts of plants, weighing 250 *grammes*, of a much less disagreeable odour than that of the liquid of the first stomach, becoming clear by filtration, yellow, and decidedly acid. The sides of the folds or valvules of the fourth stomach were covered with a small quantity of whitish glutinous matter. The liquor extracted from the first stomach did not form any deposit when left to itself. The addition of very dilute hydrochloric or sulphuric acid produced in it a coagulum, especially with the assistance of heat. Acetic acid did not act thus.

One hundred grammes of this liquor were mixed with very dilute hydrochloric acid. Litmus paper began to be reddened only when the quantity of acid represented 0gr. 20 of anhydrous subcarbonate of soda. The flocculent precipitate produced by the addition of the acid was re-dissolved by stirring the liquor. The separation of the coagulable matter was completed only when the acid added was equivalent to one gramme of alkaline carbonate.

In order to precipitate this substance from the five pints of liquid contained in the first stomach, therefore, it was necessary to mix with it an acid liquor representing 25 grammes of subcarbonate of soda, or containing 17 grammes of anydrous hydrochloric acid. But the free acid of the fourth stomach, estimated as hydrochloric acid, amounted to only 0 gr. 125, which would not amount to 1-135 of that required for precipitating the albuminous matters from the whole of the liquid of the first stomach.

To maintain the idea that the chyme is precipitated by the liquors contained in these two stomachs it would, therefore, be necessary to admit, and which is very probable, that free hydrochloric acid is incessantly developed in the fourth stomach, and that the liquid of the first stomach is introduced into it successively and in small quantities at a time. Moreover, in this experiment, we did not find any notable deposit on the sides of the fourth stomach, and the mixture of the liquids extracted from the first and fourth stomachs produced no precipitate, even by causing the acid to predominate.

Twelve other fourth stomachs, opened shortly after the sheep had been killed, did not present any deposit on the sides. The contents were moderately acid.

Several fourth stomachs, opened after a cooling of twenty-four hours, contained a glairy deposit, applied against the surface. It was very easily separated from the other matters contained in the stomach, because water did not remove it, whilst they were detached from the sides of the stomach with the greatest facility by means of a blunt knife.

This glairy substance had a powerful acid reaction, which disappeared at the end of some hours by a commencement of putrefaction. By several additions of distilled water it was only partially dissolved. The filtered liquor contained only albumen and traces of another substance to which we shall afterwards return. No casum was found in it, for acetic acid produced no precipitate. By again washing the glairy matter with distilled water, heated to 90° F., a fresh quantity of pure albumen was separated. The residue, insoluble in water, had the characters of coagulated albumen.

The liquid portion of the contents of the same fourth stomachs, after having been filtered, was quickly covered with an iris-colored pellicle. Hydrochloric acid occasioned in it no precipitate. By ebullition a voluminous coagulum of albumen was separated. The filtered liquid residue was not precipitated by acetic acid, but alcohol produced in it a very abundant white deposit. This substance, redissolved in water, formed precipitates with liquid chlorine, protochloride of mercury, sulphate of copper, nitrate of silver, the basic, neutral, and acid acetates of lead, alum, and persulphate of iron. But it likewise precipitated ferrocy-anuret of potassium, which indicated the presence of a small quantity of albumen. Tannic acid produced a white coagulum, soluble by heat, and reappearing by cooling.

The various reactions show the presence, in the liquid of the fourth stomach:—

Of uncoagulated *albumen;*

Of a matter similar to that which we found in the cotyledons of the cow, and which we designated by the name of *gelatiniform matter.*

There was no *caseum.*

Rabbits.—In a great number of experiments made on these animals, we have constantly found the masticated alimentary substance ordinarily green against the small curvature of the stomach, brown beyond this layer, and occupying two-thirds of the cavity, then under the form of globules of the size of peas in the *cul-de-sac* of the cardia, and extending in a thin layer to the middle of the great curvature of the stomach. These globules were enveloped in a white pellicle, which very easily separated from them. They varied from 20 to 200. It appeared to us that their number was greater when the animal was killed shortly after having eaten. The masticated mass and the sides of the stomach, had, in general, a very distinct acidity, except near the pylorus. At the orifice even the reaction was alkaline. The part of the masticated mass which had preserved the green colour was much less acid than the rest, doubtless because it was not yet impregnated with the gastric juice.

(To be concluded in our Pharmaceutical Number of June 30.)

* *Journal de Pharmacie and Chemist.*

(From the *Chemical Gazette.*)

RESEARCHES ON CERIUM. *By M. Hermann.*—To prepare a chemically-pure oxide of cerium, finely pulverized cerite is dissolved in boiling muriatic acid, and the silica separated in the usual manner. The solution is neutralized with ammonia, and the peroxide of iron thrown down with succinate of ammonia. An excess of ammonia is then added to the filtered liquid, which causes a very voluminous precipitate, consisting of protoxide of cerium and oxide of lanthanium, contaminated by lime, magnesia, alumina and oxide of manganese. The precipitate is dissolved in nitric acid, evaporated to dryness, and the salt ignited; it is then reduced to a very fine powder, and digested with a very dilute nitric acid (2 parts of concentrated acid to 100 parts of water). The acid dissolves the greater portion of the oxide of lanthanium and of the other bases, but leaves undissolved most of the oxide of cerium, which is mixed with traces of the oxides of lanthanium and manganese. This impure oxide of cerium is dissolved in sulphuric acid which has been diluted with equal portions of water; the solution is then mixed with 50 parts of distilled water, and the liquid made to boil. In this operation the liquid becomes opake, and deposits a sulphur-yellow precipitate, which is perfectly pure basic sulphate of cerium. All the oxide of lanthanium, which was mixed with the oxide of cerium, remains in the solution, which also contains a large quantity of the latter element. To obtain the last portions, caustic soda is added to the acid liquid, and the precipitate dissolved in nitric acid, the salt ignited, the free oxide of lanthanium extracted with dilute nitric acid, the oxide of cerium dissolved in sulphuric acid, the solution diluted and again boiled. A precipitate of basic sulphate of cerium is produced as before, which is as pure as the former.

If the oxides which are still contained in the acid liquid, boiled for the second time, be now examined, it will be found that they consist mostly of oxide of lanthanium, mixed with much oxide of manganese and some little oxide of cerium.

Atomic Weight of Cerium.—23·523 parts of anhydrous sulphate of cerium gave 29·160 parts ignited sulphate of barytes. From this the atomic weight of the protoxide of cerium is calculated at 675·0, and with the supposition that the protoxide contains 1 atom oxygen, that of cerium will be 575·0, which nearly agrees with Rammelsberg's determination.

Protoxide of Cerium.—When caustic soda in excess is added to a solution of the protosulphate of cerium, a precipitate of the hydrate of the protoxide of cerium is formed, which appears, avoiding the access of air, colourless, transparent, mucous, and very similar to the hydrate of alumina. By exposure to the air it is converted into the hydrate of the peroxide of cerium, when it assumes a light brownish colour. When the hydrate is left for any length of time exposed to the atmosphere, the precipitate acquires a yellow colour, especially when an excess of alkali is present. This colour is not peculiar to the hydrate of the peroxide of cerium, but to the carbonate. Pure hydrate of the peroxide of cerium has a perfectly light brownish colour, which becomes darker on drying the preparation.

When operating with impure salts of the peroxide of cerium, it frequently happens that precipitates are thrown down from their solutions by alkalies, which rapidly assume a dark brown colour by exposure to the air. This colouring of the oxide of cerium does not however arise from didymium, but from manganese. The oxide of manganese constantly accompanies cerium and lanthanium, and it is hidden in such a manner in its combination with the oxides of these metals, that it cannot be detected by the well-known dark amethyst-red colour which it imparts to borax before the blowpipe. But its presence is easily indicated by fusing it with caustic soda, which it colours green.

Sulphate of the Protoxide of Cerium is obtained by submitting crystallized bisulphate of the peroxide of cerium to a gentle heat. The salt swells somewhat, gives off water, sulphuric acid and oxygen, and is converted into a white porous mass of sulphate of the protoxide of cerium. When the heat is too great, the protosulphate loses somewhat of its acid, and then leaves on solution a white powder of basic protosulphate of cerium. The anhydrous neutral salt contains 57·39 per cent. protoxide of cerium, and is therefore = CeO, SO_3.

The ignited protosulphate dissolves readily in cold water, with greater difficulty in hot water. The best method of obtaining the protosulphate of cerium crystallized is to dissolve the ignited salt in cold water, and to warm this solution gradually. The hydrated sulphate of the protoxide of cerium crystallizes in fascicular and stellate groups of oblique four-sided prisms. As long as the crystals remain in the liquid they appear to possess a strong lustre, and to be transparent and colourless; taken out of the liquid, they quickly become opake and white. They contain 16·5 per cent. aq = 2 at.

The protosulphate of cerium combines with the sulphate of potash in various proportions.

Neutral Sulphate of the Protoxide of Cerium and Potash is formed when a solution of protosulphate of cerium is brought into contact with crystals of sulphate of potash, this latter always being present in great excess.

Sesquisulphate of the Protoxide of Cerium and Potash is obtained when concentrated solutions of protosulphate of cerium and 2 parts sulphate of potash are mixed together. A white powder is deposited, which contains 37·65 per cent. sulphate of potash; the formula $3\,CeO, SO_3 + 2\,KaO, SO^3$ requires 38·22.

Bisulphate of Protoxide of Cerium and Potas is formed when the quantity of the sulphate of potash is still more diminished, and concentrated solutions of equal parts of protosulphate of cerium and sulphate of potash are mixed together. A white pulverulent precipitate is obtained, which consists of 67·78 CeO, SO^3, and 32·22 $KO. SO^3$.

Oxide of Cerium is obtained purest when basic sulphate of cerium is mixed with double its weight of carbonate of soda, the mixture ignited, and the salts edulcorated; the oxide so prepared has a dirty white yellowish colour; it does not dissolve in the weaker acids, and is not even attacked by concentrated sulphuric acid, which nevertheless easily dissolves the oxide of cerium containing lanthanium. to determine its amount of oxygen, 100 parts of the basic sulphate of the oxide of cerium were dissolved in sulphuric acid, the solution evaporated, and the acid sulphate of cerium ignited. The salt is thus converted into the protosulphate of cerium, and 4·159 parts oxygen have been disengaged. Since the 100 parts of basic sulphate of cerium employed contained 59·04 parts oxide of cerium, the oxide will be composed of 4·159 oxygen and 54·881 protoxide of cerium, or in 100 parts of—

	Found.	Atoms.		Calculated.
Cerium	79·185	1 =	1150	79·310
Oxygen....	20·815	3 =	300	20·090
	100·000		1450	100·000

Bisulphate of the Peroxide of Cerium.—Basic sulphate of cerium dissolves readily in sulphuric acid, forming a yellow liquid, from which disulphate of cerium may be very readily obtained crystallized in equilateral, six-sided obtuse prisms. The salt consists of—

Oxide of cerium	36·36	36·98	1 = 1450·0	36·50
Sulphuric acid	38·00	37·21	3 = 1503·5	37·91
Water.....	25·64	25·91	9 = 1012·3	25·53
	100·00	100·00	3965·8	100·00

On submitting the salt to heat, it swells up somewhat, loses water, sulphuric acid and oxygen, and is converted into protosulphate.

Basic Sulphate of the Peroxide of Cerium.—The crystallized bisulphate of cerium cannot be dissolved in water without undergoing decomposition; the liquid becomes opake, and deposits the basic sulphate, while a portion of the salt remains dissolved in the free sulphuric acid. On heating the liquid, another portion of the salt which remained in solution separates in the state of the basic compound; but it is not possible to precipitate the whole of the oxide of cerium from the solution by boiling only. The basic sulphate of cerium is a fine milky precipitate, which unites to a light, coherent sulphur-yellow powder. It consisted of—

Oxide of cerium ..58·785	3 =	4350·0	59·04
Sulphuric acid....27·500	4 =	2004·6	27·21
Water .....13·715	9 =	1012·3	13·75
100·000		7366·9	100·00

When the basic sulphate of cerium is ignited, it changes its yellow colour into a dirty white; it does not lose any sulphuric acid, but water and 2·1 per cent. oxygen. Water extracts from the ignited mass protosulphate of cerium.

Sulphate of Cerium and Potash.—When a solution of bisulphate of cerium is mixed with a solution of sulphate of potash, a lemon-yellow pulverulent precipitate is formed which consists of—

Oxide of cerium ..27·64	1 =	1450	28·23
Sulphuric acid 49.15	5 =	2505·8	48·79
Potash.....23·21	2 =	1179·8	22·98

The salt becomes white on ignition, loses 11·7 per cent. sulphuric acid and oxygen, and is converted into sulphate of the protoxide of cerium and potash.

Prot-Hyperoxide of Cerium.—When nitrate of cerium is heated, an oxide is left behind, which contains more oxygen than oxide of cerium; on its conversion into protosulphate of cerium, it liberated 8·28 per cent. oxygen. It is therefore probably = $C_3 O^5$ or $C^2 O_3 \times CO^2$.

Per-Hyperoxide of Cerium.—When the preceding oxide is dissolved in sulphuric acid, the solution diluted with 50 parts water, and boiled basic sulphate of cerium is thrown down. If now caustic soda be added to the boiled liquid, a brown precipitate is formed, which the author suspects to consist for the greater portion of hyperoxide of cerium. On drying, this precipitate remains of a dark brown; it has a glossy fracture; on ignition it disengages carbonic acid, which the oxide had absorbed from the atmosphere, water and oxygen, and leaves behind prot-hyperoxide of cerium. 100 parts of the precipitate, dried at 212° Fahr., afforded on ignition,—

Prothyperoxide of cerium.....	73·75
Oxygen	3·40
Carbonic acid	11·59
Water	11·26

After subtracting the carbonic acid and the water, the per-hyperoxide of cerium would be composed of—

Cerium	74·60	1 = 575	742
Oxygen	25·90	2 = 200	258

Journ. für Prakt. Chem. for November.

IMPROVED METHOD OF PREPARING CHLORATE OF POTASH. *By Prof. Juch.*—Pass chlorine gas into a mixture consisting of 1 lb. caustic lime, 1 lb. carbonate of potash and 8 lbs. of water as long as there is any absorbed. In this manner two salts are obtained, which are very easily separated by crystallization; for the chlorate of potash crystallizes readily from the filtered solution, the chloride of calcium scarcely at all. In this method there is no loss of potash, in the state of chloride of potassium, which formerly amounted to nearly one-half.—*Journ. für Prakt. Chem.*

ACTION OF PRUSSIC ACID ON CALOMEL AND ON CORROSIVE SUBLIMATE.—When, according to M. Mialhe, prussic acid is poured over calomel, cyanide of mercury, muriatic acid and metallic mercury are first generated; but after longer contact, the muriatic acid for instance acts again on the mercury and cyanide of mercury, and finally a mixture is obtained of cyanide of mercury, corrosive sublimate, muriatic acid, prussic acid and metallic mercury; collateral products are ammonia and formic acid. Æther readily extracts the prussic acid and corrosive sublimate, and leaves behind the cyanide of mercury. Other salts of the protoxide of mercury undergo analogous decompositions by prussic acid and the alkaline protocyanides. M. Mailhe ascribes to this formation of cyanide of mercury the fact of several cases of poisoning having arisen from administering mixtures containing calomel and at the same time *Aqua lauro-cerasi.*

PRODUCTS OF THE DRY DISTILLATION OF TOBACCO.—Prof. W. G. Zeise, in Copenhagen, has submitted tobacco smoke and the products of the dry distillation of tobacco to an accurate chemical examination. He has found them composed of the following constituents:—A peculiar empyreumatic oil, *butyric acid*, carbonic acid, ammonia, paraffine, resin, water, probably some acetic acid, some carbonic oxide and carburetted hydrogen.—M. Zeise has not been able to detect creosote in those products, which it would seem was not formed in this operation.—*Journ. für. Prakt. Chem.*

OBSERVATIONS ON LEGUMINE. *By MM. Dumas and Cahours.*—The analysis of legumine recently published by M. Rochleder, and the properties assigned to this product, do not establish its identity with the caseine of milk in a satisfactory manner. According to that chemist, legumine, precipitated by means of weak acetic acid from water in which peas or beans reduced to a pulp had been digested, is partly soluble in potash, and may be separated by this re-agent into two products, one of which is soluble in the alkali, and is identical with caseine. However, the caseine obtained from milk has been found by all experimenters to contain on an average 15·8 per cent. of nitrogen, while the product described by M. Rochleder afforded him 14 per cent., *i. e.* one-fifteenth less, which would suppose the product to be so impure that no conclusion can be drawn from it. M. Rochleder, who draws a comparison between the carbon and hydrogen of these substances, has unfortunately neglected to do the same with respect to the nitrogen; moreover, a sample of legumine of bean containing only 53 per cent. carbon, affords in the legumine converted into caseine 54·5 carbon, the nitrogen always remaining the same, a fact somewhat difficult to explain.

M. Rochleder has not solved the question relative to legumine. We have at present no doubt that the nitrogenous substance of the *Leguminosæ* contains two distinct substances of different composition, which occur in variable proportions in the several leguminous plants, or even in the different specimens of one and the same species.

We obtained from hemp-seed, by the same means, a substance which contains the same amount of carbon as the legumine of almonds, but not more than 14·8 to 15 per cent. nitrogen. If, in fact, there exist two distinct substances, containing the same proportions of carbon and of hydrogen with different quantities of nitrogen, this latter element alone would be susceptible of variation in the several samples analysed. However it may be, we do not think it advantageous to confound at present with caseine a product which is thrown down in the cold by very dilute acetic acid, and of which nine-tenths at least are soluble in concentrated and cold acetic acid, and which is entirely coagulated by heat.—*Journ. de Pharm.*

ACTION OF SULPHUROUS ACID ON METALLIC OXIDES.—The following are the results of experiments on the action of sulphurous acid on metallic oxides by M. Vogel:—

1st. Red oxide of mercury at first becomes protoxide combined with sulphurous and sulphuric acids, and is afterwards completely reduced to the metallic state by sulphurous acid.

2nd. Pernitrate of mercury is slowly reduced by sulphurous acid, but the reduction becomes perfect with the aid of heat; the protonitrate is reduced in the same manner, but more rapidly.

3rd. Bichloride of mercury is not reduced under the same circumstances, by sulphurous acid, lower than to protochloride; and when the solution of the bichloride is mixed with a sufficient quantity of sulphurous acid, it is not decomposed by the caustic alkalies added in excess; the mercury remains in solution in the alkaline liquor.

4th. Protochloride of mercury is not reduced to the metallic state by sulphurous acid, but merely to a subchloride of mercury; but subpersulphate of mercury (turbith mineral) is entirely reduced by sulphurous acid.

5th. Neither oxide nor nitrate of silver is completely reduced by sulphurous acid.

6th. The oxides of zinc, antimony and uranium, do not suffer the slightest reduction by sulphurous acid.

7th. The black oxide of copper calcined and left in contact with sulphurous acid, becomes brown protoxide, and the acetate of the oxide becomes acetate of suboxide when heated; the greater part of the copper being deposited in the state of brown suboxide.

8th. Sesquioxide of iron when calcined does not yield any of its oxygen to sulphurous acid; but the peracetate of iron becomes protoacetate by its action.

9th. Molybdic acid is not reduced by sulphurous acid, but molybdate of potash is reduced to a low state of oxidizement, to the blue compound or molybdous acid.—*Jour. de Phar. and Phil. Mag.*

ON HIPPURIC AND ACETIC ACIDS IN THE URINE OF MAN. *By Prof. Liebig.*—When fresh urine is evaporated over the water-bath to the consistence of a thin syrup, and on cooling, one-twentieth part of strong hydrochloric acid added to it, then shake with æther, this dissolves the hippuric acid which has separated. It frequently happens that the æther; as in an emulsion, separates with difficulty from the resin; but this is instantly effected by the addition of a few drops of alcohol. In this case the æthereal solution of the hippuric acid should be shaken previous to evaporation with some water, in order to remove the urea taken up by the æthereal solution through the intermediation of the alcohol. When this is done, crystals of pure hippuric acid are obtained on evaporation of the æthereal solution. It was not absent in any of the numerous human urines examined during the last six months. Stale urine no longer contains any hippuric acid, but in its stead benzoic acid, as was long ago observed by Proust. When putrid urine is evaporated without any addition of potash to retain the benzoic acid, a large portion of it is volatilized along with the ammoniacal vapours. When concentrated putrid urine is submitted to distillation with a mineral acid, a considerable quantity of acetic acid, accompanied by benzoic acid, is obtained. This had likewise been observed by Proust. I have prepared with this acetic acid several ounces of the lead salt and of other salts, which, as well as the hippuric and benzoic acids, have been submitted to analysis; so that there can be no doubt respecting the nature of these products and educts. By product I mean the acetic acid, for I have never been able to find it in fresh urine, nor could I detect any lactic acid. It is much to be regretted, that after Berzelius's great discovery of the peculiarity of lactic acid and of its distinctness from acetic acid, in all the statements in the subsequent editions of his classic Manual, when the observers had found acetic acid, this acetic acid has been changed into lactic acid. From this time dates the wide distribution of this acid in the animal body, for none of the subsequent investigators of such bodies have taken the trouble to make any further examination.—*Archiv der Pharm.* for March.

ON THE HADSHY OF THE TURKS. *By M. Landerer.*—This beverage is derived from *Cannabis sativa.* The relations of climate, however, produce a far more considerable development of the narcotic principle.

The mode of preparing the hadshy is as follows:—When the hemp plants have blossomed, and have begun to form fruit, the delicate shoots, leaves and unripe fruit are pressed, and set into vinous fermentation by means of a syrup from sweet fruits, or rather are thrown into the fermenting liquid. The fermented liquid is poured into flasks, and frequently coloured red with *Coccus Cacti*, or *Coccus Ilicis*, and then used as a spirit.

Another kind of hadshy occurs in the form of an electuarium, which has a very quick but transitory action on the human frame.

It is prepared in the following manner:—Dates, figs, currants and other sweet fruits are pressed to a paste, mixed with fresh hemp and poppy leaves, and formed into balls, which are moistened form

time to time with spirits, and preserved in a cool place until they diffuse a strong narcotic odour, which already produces intoxicating effects. This mass is now boiled with butter and oil of sesamum, and the produces strained from the residue, poured into tin forms, and placed aside to cool. This is the hadshy of the Arabs, such as is sold in the bazaars of Cairo. It has a greenish-yellow colour, a very rancid taste, and is void of smell.

M. Landerer digested a portion of this hadshy with dilute muriatic acid, and another portion with absolute alcohol. The liquids obtained were yellowish-green, and possessed a very bitter taste. The acid liquid gave voluminous precipitates with alkalies and likewise with tannic acid, which were of a very bitter taste. A concentrated solution of this substance rubbed on the eyelid of a cat, produces in a few minutes a very perceptible dilatation of the pupil; it has likewise the same effect on the human eye. When the hadshy is mixed with water and submitted to distillation, the product obtained has a somewhat bitter taste and a faint odour of herbs. It may be drunk without producing any ill consequences.—*Buch. Rep.*

Preparation of Benzoic Acid. *By Prof. Wöhler.*—Pulverised benzoin resin is dissolved, with the assistance of heat, in about an equal volume of highly rectified alcohol, and the solution mixed while hot, but gradually, with so much fuming muriatic acid that the resin begins to be precipitated. The mass is then submitted to distillation. The benzoic acid passes over in the form of benzoic æther. The distillation is carried on as long as the consistence of the mass admits; when it becomes too thick, it is allowed to cool a little, hot water added to it, and again distilled as long as any æther passes over. The water remaining in the retort is, when clear, poured off boiling-hot from the resin; on cooling it deposits benzoic acid, probably derived from benzoic æther.

The product obtained is digested with caustic potash until the whole of the æther is decomposed, finally heated to boiling, and saturated with muriatic acid, when the benzoic acid separates in crystals on cooling.

It appears that the entire amount of benzoic acid of the resin is obtained in this manner; and it may be observed, with reference to the pharmaceutical application, that the acid so prepared possesses entirely the odour of the sublimed acid. Whether the stated proportions of resin, muriatic acid and alcohol are the most advantageous, I am not able at present to say.—*Lie.*

Carbonate of Soda in the Preparation of Coffee.—M. Pleischel states from experience, that the infusion of roasted coffee acquires a far superior taste, and is rendered more concentrated, consequently that a much larger amount of beverage can be prepared from the same quantity of coffee, by adding to the boiling water, just before pouring it over the coffe, I gr. of crystallized carbonate of soda for every cup, or 2½ grs. for every half ounce of coffee.—*Med. Jahrb. des Oestr. St.*

On the Decoloration and Blackening of Ointments containing Peroxide of Mercury. *By M. Alb. Frickhinger.*—All the ointments containing peroxide of mercury lose their colour by keeping; this happens even when the purest peroxide of mercury has been employed; ointments of which wax is a constituent produce effect this most rapidly, and it is advisable, especially with Yve's ointment, to add the oxide of mercury *after* cooling. With ointments into the composition of which no wax enters, it is indifferent whether the oxide is added to the warm fat or not. Sometimes, but more rarely, these mercurial ointments have been observed to become grayish-black, beginning from the surface; this is generally ascribed to the reduction of some mercury from the use of an iron spatula.

The author examined both fresh and entirely decolored, as well as gray-coloured ointment, and found the peroxide of mercury to have lost in the altered ointments its crystalline structure; but dilute muriatic acid and dilute nitric acid extract from all three, both peroxide and protoxide. When the fat was extracted from all three ointments by means of æther (the æther obtained from all deposited with sulphuretted hydrogen a brownish-black coloured fat, containing therefore mercury), peroxide of mercury was first deposited; in each case above it there was in the decolorized preparation a white layer of protoxide of mercury in combination with fatty acids, in the gray one a gray powder of protoxide of mercury; both, however, still contained peroxide. The author believes that the cause of the blackening is probably owing to the intervention of ammonia.—*Buch. Repert.*, xxxi. p.305.

Capsulæ gelatinosæ Assafœtidæ. *By O. Schneider.*—The complaints of several physicians respecting the difficultics of administering assafœtida internally to patients, especially children, from the odour and taste being so repugnant, has induced me to make some *Capsulæ assafœtidæ* similar to those for *Bals. copaivæ.* For this purpose I form some pills of pure *assafœtida*, about 2 grs. in weight, stick them on to needles, and coat them with a solution of Paris gelatine by immersion, and lastly close carefully with a brush the holes left by the needles. Being void of odour or taste, no one has any longer refused to take this medicine, which has since enjoyed in this town (Dresden) a very considerable and successful application. Unfortunately, however, the preparation is very troublesome, and requires so much time as to render it expensive.—*Arch der Pharm.* Feb. 1844.

On the Transformation of Fibrine into Butyric Acid. *By Ad. Wurtz.*—When fibrine is exposed to the air during the heat of summer, it becomes entirely converted into a liquid in the course of eight days, which diffuses an odour of putrid cheese and is coagulated by heat. This last property is due to the albumen which it contains, and which may be easily isolated by precipitating the liquor, diluted with water and filtered, with the subacetate of lead, washing the deposit and decomposing it by a current of carbonic acid. A solution, coagulable by heat, is thus obtained, which presents all the characters of albumen. The other products of this putrefaction are carbonic, acetic and butyric acids, and ammonia.

In order to isolate the butyric acid, I diluted the liquid arising from the putrefaction of the fibrine with twice its volume of water, heated the liquor, and added sulphuric acid in slight excess. The precipitated albumen was separated by filtration, and the clear liquor distilled to within half its volume. The product of distillation reddened blue litmus-paper strongly; it was neutralized with carbonate of lead, and the solution evaporated. At a certain degree of concentration butyrate of lead separated from it in the form of a thick oil, which changed into a soft resinous mass on the cooling of the liquid. This was decanted, evaporated to dryness, then re-dissolved in alcohol. The alcoholic solution, having been mixed with water, became turbid, and deposited a fresh quantity of butyrate of lead, offering the characters which I have just indicated. This salt was re-dissolved in weak alcohol, and decomposed with a sufficient quantity of caustic potash. The filtered liquid was evaporated nearly to dryness, then treated with concentrated phosphoric acid, which separated an oily layer from the liquor, which was removed in order to submit it to distillation. The point of ebullition of the acid rose rapidly from 266° to above 320°, and the product of distillation, which was quite colourless, presented all the characters of butyric acid.

Putrefaction is not the only way in which fibrine is transformed into a fat volatile body. I have observed that by heating pure fibrine with potash-lime in an oil-bath at a temperature of from 320° to 356°, a small quantity of a volatile fat acid forms, which remains in combination with the potash, whilst ammonia and other volatile products are disengaged. It is easy to extract the volatile fat acid from the residue, by dissolving this in water, supersaturating with phosphoric acid, and submitting the liquid to distillation. The distilled product is neutralized with an alkali, evaporated, and the residue treated with syrupy phosphoric acid, which separates an oily layer from it, easily recognised as a volatile fat acid. This acid possesses the properties of butyric acid; I have, however, not yet verified its identity with this acid by analysis.—*Comptes Rendus.*

On the Amides which originate from the Action of Ammonia on Fat and Oils, especially on Margaramide. *By M. Boullay.*—The action of ammonia on fats is totally different from that of the fixed alkalies. According to the author, amides of the fat acids are formed. If we consider this in connexion with the few experiments which we possess, by Bonaster and Dumas on oil of cloves and oil of cinnamon, by Dumas and Pelouze on oil of mustard and oil of bitter almonds, by Cahours on oil of carraway, oil of cinnamon and oil of gaultheria, with respect to their behaviour towards ammonia, the action of ammonia on the fat and essential oils contained in plants appears to act an important part in the formation of the amidogenoid vegetable substances, especially of the alkaloids.

The author first operated upon olive oil and pork fat, and saponified these either by means of a current of ammoniacal gas, or by mixing with an alcoholic solution of ammonia, or lastly, by leaving them in contact for a long time with an aqueous solution of ammonia. The soap has at first an alkaline reaction, but if it be warmed at 86° Fahr. until no more ammonia escapes, it becomes perfectly neutral. It may be divided in boiling water, but does not dissolve; on cooling, the greater portion solidifies on the surface, while glycerine, colouring substance, and the acid salt of ammonia or an acid which is precipitated by acetate of lead and nitrate of silver, but not by lime and bayrites, remain dissolved in the water. If the separated solid substance is dissolved in boiling alcohol, and the solution set aside to cool, a white, crystalline, perfectly neutral substance separates, while small quantities of margaric and oxalic acids remain in the mother-ley. The substance, purified by repeated crystallization, melted and dried in the water-bath, is pure margaramide; it is white, solid, perfectly neutral, readily soluble in alcohol and æther, but not at all in water. It separates from the hot solutions on cooling in needles or warty transparent masses. It melts at 140° Fahr., and burns like fat with a luminous flame, leaving no carbonaceous residue. Dilute solutions of potash, soda, lime and barytes do not act upon it; but when boiling and concentrated, they disengage ammonia and leave behind a salt of margaric acid. Acids act likewise only when concentrated, and especially when warm. Margaramide consists of

Carbon	75·68	75·81	34	75·8
Hydrogen	13·05	12·88	35	13·0
Nitrogen	5·33	5·31	1	5·2
Oxygen	5·94	6·00	2	6·0

The formula is therefore = C^{34} H^{33} O_2, NH_2, *i. e.* anhydrous margarate of ammonia minus 1 equiv. of water.

Oil of almonds, rape oil, nut oil and poppy oil afforded perfectly analogous results; castor oil is peculiar, from the rapidity of the action and the remarkable products.—*Comptes Rendus.*

Method of distinguishing between the various kinds of Starch by means of Iodine. *By M. Gobley.*—The author places the starch in watch-glasses under a bell-glass containing iodine, and leaves them exposed there for four-and-twenty hours, when the granules acquire the following colourings:—

Wheat-starch	Violet.
Potato-starch	Dove-gray.
Genuine arrow root	Bright chocolate colour.
Arrow root with ¼ wheat-starch	Grayish-lilac.
Manufactured arrow root	Dove-gray.
Genuine tapioca, entire	All the granules yellowish.
..... pulverised	Chamois colour.
Pulverised tapioca mixed with ¼ wheat-starch	Violet.
Spurious tapioca, entire	Some granules of a violet-gray, others yellowish.
..... pulverised	Chamois colour.
The same with ¼ wheat-starch	Violet.
White sago, entire	Some granules of a violet-gray, others yellowish.
.....pulverised	Chamois colour.
The same with ¼ wheat-starch	Violet.
Spurious sago, entire	Some granules violet-gray, the others yellowish.
.....pulverised	Chamois.
The same with ¼ wheat-starch	Violet.
Dextrine	No colouring.

From the above it will be seen that wheat and potato-starch acquire, under the influence of iodine vapour, a widely different colouring; that arrow-root, which when pure assumes a light chocolate colour, becomes of a lilac-gray when mixed with ¼ wheat-starch; and that spurious arrow-root assumes a dove-gray colour, that is to say, the same colouring as the potato-starch from which it had been prepared; that the tapiocas and sagos, entire, genuine or spurious, acquire the same yellowish tint; that the powders, genuine and spurious, all acquire a chamois colour.

Thus it is possible, by means of iodine vapour, to distinguish between wheat and potato-starch, genuine arrow root from spurious, or when mixed with wheat-starch. It is also possible to determine whether the tapioca powders, genuine and spurious, have been replaced by corn or potato-starch, or have been mixed with them; but it will be impossible to decide whether manufactured tapioca and sago powders have been substituted for genuine.

The colouring of the starch granules is owing to the property which these bodies possess of absorbing the vapour of iodine and water. Experiment shows that these granules are not coloured by iodine unless moist. When they have been dried at

212°, they absorb iodine, it is true, but only become coloured on recombining with water.—*Journ. de Pharm.*

PREPARATION OF THE PERCHLORIDE OF IRON. *By M. Gobley.*—Sesquichloride or perchloride of iron exists in the anhydrous state and in the state of hydrate.

To obtain the anhydrous perchloride there are two processes. The first consists in placing in a luted glass or porcelain tube iron hammerings, and inserting the tube in a furnace; the tube should project some distance beyond the furnace. When the apparatus is thus arranged, that portion of the tube where the iron is placed is heated to a temperature below red heat, about 752°, and a current of dry chlorine is then passed through by one of its extremities. The gas is rapidly absorbed, the iron becomes incandescent, and gives off abundant vapours of sesquichloride, which condense in the cold portion of the tube projecting beyond the furnace, in the form of laminæ of a dark violet colour, and possessed of a metallic lustre.

The second process consists in saturating commercial muriatic acid with dry or moist hydrate of the peroxide of iron. The solution is first effected at the ordinary temperature, then assisted by a gentle heat; and when the acid no longer takes up any oxide, the liquid is filtered, evaporated to dryness in a porcelain capsule, taking care to moderate the heat and to stir constantly. The product of this operation is transferred into an earthern retort, and heat gradually applied, taking care not to place any fire near the dome of the retort. Aqueous vapours are first disengaged; when they have ceased a cork is adapted loosely to the aperture of the retort, and the fire is then raised, so that the bottom of the retort is nearly red-hot towards the close of the operation. The anhydrous perchloride sublimes on to the dome, and into the neck of the retort; when this has cooled sufficiently it is broken, the chloride removed and transferred immediately into the bottles destined to receive it.

Although the last of the two processes described is the best and most easy of execution, there are many pharmaceutists who are prevented from following it, and the medicinal perchloride of iron of the Codex is that which is obtained by the moist way. Several processes have been proposed for the preparation of the hydrated perchloride of iron. The Codex prescribes dissolving red oxide of iron in hydrochloric acid, and evaporating the solution to dryness over the water-bath. This process is bad, for the product always contains, however carefully the evaporation may have been made, a large proportion of insoluble oxychloride.

Thénard, Berzelius and Orfila advise, in their works, dissolving sesquioxide of iron in hydrochloric acid, evaporating the solution to a syrupy consistence, and allowing to cool. The perchloride is deposited in the form of beautiful red crystals, which deliquesce with the greatest facility.

M. Béral proposed preparing it by dissolving precipitated sesquioxide of iron in hydrochloric acid, first cold and then over a water-bath; the solution is transferred into a porcelain capsule, and evaporated at a gentle heat to a syrupy consistence; when arrived at this point, the capsule containing the perchloride of iron is placed by the side of another containing caustic potash or lime, and the whole covered with a bell-glass. The alkali absorbs both the water and the hydrochloric acid, so that in ten to fifteen days the chloride forms a dry, confusedly-crystallised mass, which is then transferred into a bottle under the bell-glass, to prevent the salts deliquescing in the air. This process succeeds very well, but it requires much time, and gives a chloride which is not of constant composition, because it retains variable quantities of water, owing to the method of its preparation.

M. Mohr has recently proposed for preparing perchloride of iron, dissolving hæmatite by digestion in commercial hydrochloric acid, and boiling towards the end of the operation. The liquid is allowed to clarify, is then evaporated to the consistence of a liquid syrup, and placed, well-covered, in a cold situation, for instance in a cellar, where it begins to crystallise after some days, and continues to do so for some weeks; the mother-water is decanted and the crystals preserved. M. Mohr analysed the crystals prepared in this manner, and found them to contain 12 atoms of water; he has consequently assigned to it the formula $Fe^2 Cl^3$ 12HO.

M. Fritzsche, who undertook a fresh investigation in order to determine the proportion of water contained in the chloride of M. Mohr, found that this chloride gave very different results on analysis with respect to the quantity of water, which is equally the case with those obtained by the process described by Orfila, Thénard and Berzelius, and that it was impossible to decide whether it contained 10, 11 or 12 atoms of water; with 10 atoms it should contain 35·92 per cent., with 11, 38·15, and with 12, 40·22. According to the same chemist, on leaving the preceding chloride under a bell glass with sulphuric acid, the crystals are again converted into a thick liquid, which gives rise to other crystals, containing from 21 to 23 per cent. water; 5 atoms would require 21·9 per cent. According to M. Fritzsche, the same crystals are obtained by fusing the chloride with 10, 11 or 12 atoms of water, and evaporating until a drop solidifies on cooling, and then adding a few drops of concentrated hydrochloric acid before placing it aside to cool.

M. Fritzsche has been led by his experiments to admit the existence of two hydrates of the perchloride of iron perfectly crystalline, between which there is no other crystalline combination. It will be seen from the above that the processes which have been described for the preparation of the hydrated perchloride of iron are very numerous; but it may be said that neither admits of the perchloride being obtained of a constant composition, in a short time, entirely soluble, and capable of long preservation. The principal cause of the easy alteration of the chloride of iron prepared by the processes described, appears to be the large quantity of water which the preparation retains; for instance, that of M. Béral, which contains least, affords, shortly after its preparation, a perceptible deposit of oxychloride when dissolved in water. Induced by M. Soubeiran to find out a practical process which would allow of obtaining in a short time a perchloride of iron completely soluble, and of a constant composition, I believe I have succeeded by submitting the solution of sesquioxide of iron in hydrochloric acid to the two following conditions of evaporation:—1st, evaporation at a temperature not exceeding 212°, and 2nd, evaporation in perfectly dry air.

After several experiments I stopped at the following process:—Pulverized hæmatite is introduced into a stoppered flask, and a quantity of pure concentrated hydrochloric acid poured over it; there should be an excess of hæmatite; it is then agitated. The two bodies soon react on each other, forming water and perchloride of iron, with disengagement of heat; when the first action is passed over, the flask is placed near the fire and shaken frequently; after severel hours' contact it is allowed to subside, and is filtered. The filtered liquid is received in a porcelain capsule, which is placed either on some sand heated by steam, or on the head of an alembic, taking care to interpose a piece of flannel between the alembic and the capsule, and to maintain this in its position by means of a piece of string. The apparatus should be so arranged that the steam is conveyed by a long tube into a vessel full of cold water, for it is essential to the success of the operation that no aqueous vapour should circulate around the capsule; since when the liquid is evaporated in an atmosphere charged with humidity, it is decomposed when the salt has reached a certain degree of concentration, hydrochloric acid is disengaged, and sesquioxide of iron precipitated. It must be stirred with a glass spatula during the whole time of evaporation, which is continued until the liquid no longer disengages any perceptible vapours of hydrochloric acid, and a drop solidifies on cooling. When it has reached this point, the chloride is poured into perfectly dry phials, provided with good corks; but from this chloride becoming very hard, it is difficult to remove it from the phials. To obviate this inconvenience, M. Soubeiran, who had the kindness to repeat the process, advises its being poured on to a slightly greased plate, which is immediately covered by another plate, and joined to the first by means of a little luting. After four-and-twenty hours the plates are separated, the chloride broken into pieces, and immediately transferred into well dried bottles, which are corked with great care.

The perchloride of iron, prepared in this manner, possesses a dark yellowish-red colour, no odour, but a very styptic taste. It is excessively and entirely soluble in water; the solution, which is of a beautiful golden yellow, preserves for an indefinite length of time, exposed to the air, without becoming turbid; it is likewise very soluble in alcohol and æther. Exposed to the air it rapidly absorbs moisture, which at first it solidifies, but subsequently it deliquesces and it is therefore necessary to keep it in dry and well-closed bottles. This chloride has the great advantage of keeping for a long time without being decomposed, owing without doubt to the small quantity of water it contains: thus the samples which I possess are as good at present as they were eight months ago, immediately after their preparation.

To ascertain the quantity of water which it contains, I took four samples of the chloride, one of which had been prepared by M. Soubeiran and the other three by myself, 1 grm. of each was decomposed by a gentle heat, and the decomposition assisted by adding several times a few drops of nitric acid. That prepared by M. Soubeiran left 0·393, and the three others 0·392, 0·385, 0·380. The mean of these four quantities is 38·75, which represent 26·86 per cent. iron, which require 52·58 chlorine to form sesquichloride. 100 parts of the chloride consist therefore of—

Iron	26·86
Chlorine	52·58
Water	20·56
	100·00

This chloride contains about one-fifth of its weight of water, or somewhat less than 5 atoms, which require 21·9 per cent. It corresponds to the hydrate with 5 atoms of water of M. Fritzsche.

The process which I propose has therefore the great advantage of affording an entirely soluble chloride of a constant composition, and susceptible of long preservation, which hitherto had not been attained.—*Journ de Pharm.*

ON A NEW SULPHATE OF THE PEROXIDE AND PROTOXIDE OF IRON. *By M. Abich.*—This salt is obtained in the following manner:—16 parts of pure crystallized protosulphate of iron are dissolved in water to form a moderately concentrated solution, which is mixed with an equal weight of concentrated sulphuric acid; it is then heated to boiling, 1 part of strong nitric acid and a concentrated solution of from 5 to 6 parts of alum added to it. When the solution is evaporated over a water-bath at a temperature not exceeding 158°, a dark green crystalline powder separates; the mother-ley is poured off and the powder redissolved with the assistance of a gentle heat, in water strongly acidulated with sulphuric acid. On slowly evaporating this solution, black crystals are formed at the bottom and on the surface of the liquid, where they form a crust which subsequently subsides. These crystals belong to the regular system, and form a combination of theoctahedron with the hexahedron. This salt is washed with strong alcohol to remove the water and acid, and dried quickly. The colour is actually a dark green, but it approaches to black. The surfaces of the crytals have a diamond lustre. It may be preserved in dry air, for instance, in a well-stoppered bottle; but when exposed to the ordinary air it absorbs moisture, and acquires a dull appearance from the surface becoming covered with minute crystals of $Fe^2 O^3$, SO^3. The salt is composed of $3(FeO, SO^3)+2Fe^2 O^3, 3SO^3$ and the crystals contain 2 atoms of salt combined with 9 atoms of water, which amount to 15·94 per cent. On analysis 14·16 per cent. was obtained; so that, if we suppose 1 per cent. of the water to arise from the mother-ley inclosed in the crystals, each atom of salt would contain 4 atoms of water. M. Abich observes that he was not able to obtain this salt without a small portion of the peroxide of iron being replaced by alumina; according to his analysis, 2·2 per cent. alumina to 17·65 per cent. peroxide of iron: it is on this account that alum is added. When the solution of the salt in acid water is evaporated too quickly, the formation of crystals is prevented, and only micaceous scales are obtained, which contain a less amount of water. This can be prevented by adding, on redissolving the precipitated salt in acid water, a quantity of crystallized sulphate of copper equal to one-sixteenth the weight of the protosulphate of iron employed, none of which, however, is taken up by the crystals.—Berzelius's *Jahresbericht.*

ON THE QUANTITY OF CARBONIC ACID EXPIRED BY MAN, *from the Experiments of Andral and Gavarret, Scharling, Brunner and Valeatin, as well as the Remarks of the latter on the Theory of Respiration.*—The question of the quantity of carbonic acid expired by a person in twenty-four hours, which has again become of extraordinary interest in consequence of the late advances in physiological chemistry, has been answered almost simultaneously from several quarters. The calculations of Lavoisier and Seguin, based on the supposition that the respiratory process is perfectly uniform, have hitherto been received, because those of Davy, Allen and Pepys appeared too high. According to their observations a man inspires 12,661 grs. of oxygen, and expires 8,584 grs. of carbonic acid (=2,820 grs. of carbon) in twenty-four hours. Prout has, however, shown that the former statement is erroneous, that, for instance, the quantity of carbonic acid expired during the night is less.

Liebig endeavoured indirectly to estimate the quantity by comparing the amount of carbon contained in the food consumed during the twenty-four hours with the carbon of the excrements voided in the same time, and estimating the difference as the

quantity separated by the respiratory process. He thus found that an adult, taking moderate exercise, expired daily on an average 13·9 oz. of carbon (more than double the quantity found by Lavoisier). All this rendered a repetition of the examinations requisite.

Experiments made for this purpose have, as is well known, to overcome great difficulties, for the apparatus which collects the products completely at the same time generally renders the breathing irregular. We will now see how the different experimenters endeavoured to solve this problem.

Andral and Gavarret adopted the method proposed by Dumas and Boussingault. They fitted a mask air-tight to the face, and tubes communicating with this were so arranged that the air could be inspired through two of them (a valve preventing the air from escaping during expiration); the third, which transmitted the expired air, was provided with a stopcock, and connected with three exhausted balloons; the cork being turned during expiration, the air was allowed to escape through the tube, which was closed by the cock during inspiration.

The necessary calculations were made for temperature and barometric pressure, and each experiment was continued from eight to thirteen minutes, The expansive coefficient of the air was considered as = ·00366. In each experiment about 130 litres of dried gas were collected. The products were passed over a mixture of sulphuric acid and pumice-stone, and solution of potash in a Liebig's apparatus. The only error in these experiments was the amount of carbonic acid being estimated rather too highly on account of some undecomposed air remaining in the apparatus; but this was found to be so inconsiderable as not to interfere with the general results. Scharling proceeded in an entirely different manner. He used a box, in which the person experimented upon was inclosed air-tight. Tubes passed into the top and bottom of this box; and into the lowest tube, admitting the air into the box, solution of potash was contained, to deprive the air of any carbonic acid. The expired air was passed through sulphuric acid, solution of potash, and lime water, to deprive it of all moisture and carbonic acid. The quantity of carbonic acid in the box at the commencement and termination of the experiment was estimated by glass tubes filled with mercury, &c. The persons experimented upon were amused by working, reading, &c., and every precaution was taken to keep the respiration perfectly free and normal. The experiments never lasted more than an hour.

Brunner and Valentin, who attended less to the absolute quantity of carbonic acid, but rather to its relation to the inspired oxygen, did not in their experiments insure so perfect a freedom of the respiratory process, as they prevented any loss of the collected gases. They made use of two different kinds of apparatus. In the first method the expired air was passed through asbestus moistened with sulphuric acid, thence into a three-necked bottle. The air in the latter was expelled by displacement, being forced out by the expired air. The expiration was continued for fifteen minutes, when it was concluded that no other than the products of expiration existed in the bottle. This was then passed through asbestus and acid, a phosphorus eudiometer, and a tube containing freshly-hydrated lime, and sulphuric acid and pumice-stone (the lime and acid were separated by pieces of porcelain and cotton), and finally a bottle containing lime-water. The air was forced out of the bottle by pouring mercury through a funnel fixed in its middle neck. In each experiment 618·457 cubic centimetres of expired air were analysed in the space of from twenty to thirty minutes. In calculating the results, the weight of 1 litre of oxygen at 32° Fahr. and ·76 barom. was considered as = 1·4323 grm.; of 1 litre of carbonic acid = 1·2675 grm.: and of 1 litre of nitrogen = 1.2675 grm.: the coefficient of expansion of the air, oxygen and nitrogen, was estimated as ·0103665, and of carbonic acid ·00369087. The amount of inspired air was separately ascertained from the volume of nitrogen, which remained as the difference of weight after the volume of oxygen and carbonic acid had been found.

In their second experiments, a bottle holding 15,000 cubic centimetres was used, and filled with salt and water. Expiration was made into this bottle with the nostrils closed, inspiration being made through the open nostrils; the bottle became filled with the products of expiration in from fifteen to eighteen minutes. The breathing tube was then removed, and the expired products passed through tubes, containing sulphuric acid and pumice-stone, lime-water, and lastly, a phosphorus eudiometer. An aspirator filled with oil concluded the apparatus. Upon allowing the oil to escape, the air was drawn through the system of tubes, and became deprived of its oxygen and carbonic acid, the nitrogen alone remaining. The results are calculated as above. Salt water is used because it absorbs very little carbonic acid. In each anylysis 529·42 cubic centimetres of carbonic acid were forced through the apparatus. If the tube containing the lime, on using this apparatus, is weighed at the commencement, the absolute quantity of carbonic acid expired can then be found, provided the time has been noticed in which the volume of carbonic acid was breathed.

Results: A. *Absolute Quantity of expired Carbonic Acid.*—Andral and Gavarret expressed their results per hour. They are contained in the following table:—

MALE SEX.

Age.	Muscular development.	Carbon consumed per hour. grms.
8	Moderate	5·0
10	Very great	6·8
12	Moderate	7·4
12	Great	8·3
14	Moderate	8·2
16½	Good	10·2
18	Good	11·1
20	Good	10·8
24	Moderate (mean of 2)	11·5
26	Extraordinarily great	14·1 / 14·1
26	Moderate	11·0
28	Good	12·4
32	Good	11.5
33	Moderate (mean of 6)	10·7
37	Moderate	10·7
40	Very great	12·1
45	Very slight (mean of 4)	8·6
48	Good	10·5
50	Good	10·7
54	Very great	10·6
59	Moderate	10·0
60	Extraordinarily great	13·6
63	Extraordinarily great	12·4
64	Slight	8·7
68	Moderate	9·6
76	Slight	6·0
92	Extraordinarily great	8·8
102	Extremely diminished	5.9

FEMALE SEX.

Periods of life.	Age.	Muscular development.	Carbon consumed per hour.
Prior to the appearance of the catamenia.	10	Good	6·0
	11	Good	6 2
	13	Great	6.3
	15½	Very Great	7·1
During menstrual life.	15½	Moderate	6·3
	19	Very Great	7·0
	22	Good	6·7
	26	Slight	6·0
	26	Moderate	6·3
	32	Moderate	6·2
	45	Moderate	6.2
After cessation of catamenia	38	Moderate	7·8
	42	Good	8·3
	44	Very Great	9·9
	49	Moderate	7·4
	52	Moderate	7·5
	56	Moderate	7·1
	63	Moderate	6·9
	66	Moderate	6·8
	76	Very great	6·6
	82	Moderate	6·0
3 months pregnant.	42	Good	7·8
5 m. do.	32	Good	8·1
7½ m. do.	18	Slight	7.3
8½ m. do.	22	Good	8·4

It is thus seen that in general the amount of carbonic acid expired by both sexes increases with age up to a certain point, the 40-45th year, and then diminishes; that the quantity of carbonic acid expired especially increases with the development of the muscular system; that women expire less carbonic acid than men; that the formation of carbonic acid attains its maximum at the commencement of menstruation, and then experiences no further increase, except in the pregnant state, until the cessation of menstruation, when an increase again takes place. On an average, an adult male, moderate constitution, consumes 10·5-11 grms. of carbon per hour; an adult female in the unimpregnated state 6·5-7; during pregnancy, 8; and after the cessation of the catamenia, 7·5-8·5. Dumas also found 10 grms. per hour as the average quantity of carbon consumed by an adult male.

Scharling's experiments were made on the following individuals:- 1st, a male æt. thirty-five, weighing 131 lbs.; 2nd, a male æt. sixteen, weighing 115½ lbs.; 3rd, a soldier, æt. twenty-eight, weighing 164 lbs.; 4th, a girl æt. nineteen, weighing 111½ lbs.; 5th, a boy æt. nine and three-quarters, weighing 44 lbs.; and 6th, a girl æt. ten, weighing 46 lbs. The carbon consumed per hour amounted to—

No. of the person.	Amount of carbon. grs.	Remarks.
1.		
In June	145	Fasting.
when	190	After breakfast and a walk.
very hot.	130	Hungry.
	165	2 hours after dinner.
	160	After tea.
	100	Whilst asleep.
2.		
In June	114	Sleepy.
when	144·2	Fasting.
very hot.	139·8	Fasting and hungry.
	177	½ an hour after breakfast.
	167·7	2½ hours after breakfast.
	180·8	2 hours after dinner.
3.		
In	137·8	Asleep.
October.	111·9	Fasting.
	159·4	Fasting, after breakfast & work.
	188·9	After dinner.
	194·7	3 hours after dinner.
	178·3	After work.
	122·3	Whilst asleep.
4.		
In	98·9	Whilst eating.
October.	91·3	Fasting.
	92·6	After supper.
	133·8	1 hour after breakfast.
	117·0	1 hour after dinner.
	108·9	Whilst eating.
5.		
In	76·2	Fasting.
Autumn.	94·8	Whilst at breakfast.
	113·8	After breakfast.
	119·3	1 hour after dinner.
	84·5	2 hours after supper.
	74·8	Whilst sleepy.
6.		
In	65·5	Whilst asleep.
Autumn.	95·3	After breakfast.
	103·0	After dinner.
	99·0	Shortly after tea.
	75·1	Whilst asleep.

Supposing that adults sleep seven, children nine hours per day, the amount of carbon consumed is on an average—

	In 24 hours. grms.	In 1 hour. grms.
1.	219·47	9·188
2.	224·37	9·389
3.	239·71	9·980
4.	165·88	6·812
5.	133·13	5·517
6.	125·42	5·226

It is thus evident that the quantity of carbonic acid expired is very variable, and that a number of circumstance are able to alter it. Hunger and repose diminish, satiety and labour increase it; it is greater during the day than the night (about 1·24 : 1).

In other respects, the results agree accurately with those of Andral and Gavarret, if we recollect that they experimented only during the day, whilst the above numbers give the average of both day and night. The differences between the maximum and minimum observed by the same authors, are as 1·5 : 1 to 1·74 : 1, as a mean 1·616 : 1.

If the expired carbonic acid is estimated in relation to the weight of the body, it is found that children consume somewhat more carbon than adults Sickness diminishes the amount of carbonic acid. The consumption of carbonic acid is modified principally by the fitness of the respiratory organs in each case to carry on the process, and the state of the circulation.

The influence of muscular activity on the amount of carbon consumed has been clearly shown by some experiments made by Dr. Hofmann during a pedestrian tour. His diet was simple and scanty; he took no drink, walked during the whole day, weighed all his food and every excretion which was possible (even the usual nasal mucus), as well as himself; he then found that the weight lost by the body was never equalled by the excess of the excrements over the food, and that there was a constant loss of matter by the skin and lungs which amounted to more than 1 lb. We must pass over the details of his experiments. Brunner and Velentin found that the weight of carbon they consumed per hour was = 8·7-11·0 grms., on an average 10·4. The volume of expired carbonic acid per hour on an average was equal to 21·8 litres, and the volume of

the air altogether which was expired per hour was = 540 litres on an average. These results agree well with those of the earlier observers. When the corrections for moisture are made, the quantity of carbon expired per hour is equal on an average to 11·2 grms, and of carbonic acid 23·5 litres.

B. *Relations of the Constituents of the expired Air altogether to the Theory of Respiration.*—On this point Brunner and Valentin only have experimented. They found—

Individual.	Number of experiments.	Volume per cent. CO_2.	Volume per cent. O.	Volume per cent. N.	Volume per cent. in relation to the atmosphere. Disappeared O.		Volume per cent. in relation to the atmosphere. Difference of N.	Weight per cent. CO_2.	Weight per cent. O.	Weight per cent. N.	Volume per cent in relation to the atmosphere. Disappeared O.		Volume per cent in relation to the atmosphere. Differ. of N.
Brunner.	Mean of 12 experiments, 1st series	4·356	16·007	79.547	4.720	+	0·362	6·522	17·428	76·050	5·582		—0·940
	Mean of 4 experiments, 2nd	3·825	16·306	79·869	4·508	+	0·683	5·749	17·735	76·516	5·275		—0·474
Thomas.	Mean of 4 experiments, 1st	4·673	15·895	79·432	4.920	+	0·329	6·975	17·165	75·860	5·845		—1·130
Valentin.	Mean of 2 experiments, 1st	4·316	16·143	79·541	4.671	+	0·356	6·458	17·481	76·061	5·529		—0·929
	Mean of 12 experiments, 2nd	4·641	15·783	79·576	5·032	+	0·391	6·945	17·089	75.965	5·920		—1·025
	Total average	4·380	16·033	79·587	4·783	+	0·402	6.546	17·373	76·081	5·637		—0.909

It is thus next evident, that the variations observed in the amount of nitrogen are entirely within the errors of observation, and the nitrogen may be considered as inactive.

Again, the expired air contains a volume of carbonic acid, which is but little less than the volume of oxygen which has disappeared (therefore the weight per cent. of the carbonic acid is necessarily somewhat greater than that of the absorbed oxygen, and thus also the difference of nitrogen appears positive as regards volume, but negative as regards weight); so that all the oxygen absorbed reappears as carbonic acid, except a small quantity consumed in the body for other purposes. Now, according to Graham's law of the diffusion of gases, when they are separated by an animal membrane and are under equal pressure, they become mixed inversely as the square roots of their densities; consequently 1·17585 volume of oxygen is absorbed for one volume of expired carbonic acid. Comparison of the figures shows us that the mixture of the two gases in respiration takes place entirely according to the law of diffusion of gases; for a method of experimenting, as accurate as possible, gave results in which the figures obtained for the carbonic acid and absorbed oxygen almost exactly agreed with those reckoned according to the law of the diffusion of gases:

Volume per cent. of the expired air. CO_2.	O.	N.	Oxygen absorbed.	Carbonic acid calculated.	Difference. per cent.
3·850	16·270	79·185	4·690	3·994	+ 0·144
3·593	16 034	79·185	4·931	4·199	+ 0·606
3·949	16·090	79·185	4·887	4·162	+ 0·213
3·777	16·090	79·185	4·914	4·192	+ 0·415
3·759	16·095	79·185	4·922	4·192	+ 0·433
4·483	15·328	79·185	5·698	4·853	+ 0·370
4·752	14·733	79·185	6 362	5·418	+ 0·660
4·588	14·852	79·185	6·253	5·326	+ 0·737

In respiration, which is consequently a purely mechanical process, the inspired air is first warmed to 99°·5 Fahr., and saturated with moisture at this temperature, which is rapidly accomplished on account of its extensive distribution. It then experiences a simple diffusion; the nitrogen remains entirely unaffected; 1·1742 volume of oxygen is absorbed, and replaced by 1 volume of carbonic acid which is expired, or for each volume of oxygen absorbed 0·8516 volume of carbonic acid appears. In consequence of the accuracy with which the law of diffusion is here observed, the most minute portion only of other gases is absorbed or expired.

That hydrogen, carburetted hydrogen and carbonic oxide gases are not contained in the expired air, the authors have shown by some direct experiments; but small quantities of organic matters during respiration are evolved, as is shown by sulphuric acid, through which the expired air passes, being always coloured red. It need hardly be mentioned, that the authors, in calculating the results, adopted every precaution to insure accuracy, and made every necessary correction. For further details we must refer to the original treatises.—Andral and Gavaret, *Ann. de Chim. et de Phys.*, Trois. Sér. 8 Juin 1843, pp. 129-150; Scharling, *Ann. der Chem. und Pharm.*, xlv. pp. 214-242; Hofmann, *Ibid.* pp. 242-249; Brunner and Valentin, *Medicinische Vierteljahrsschrift; Archiv für Physiol, Heilk.* von Roser und Wunderlich. Zweiter Jahrgang, 1843. Heft iii. pp. 373-417. *Chemical Gazette.*

On the Detection of Arsenic. *By MM. Duflos and Hirsch.*—A small work has appeared by Duflos and Hirsch*, on testing for arsenic in general, which in a space of fifty pages gives a clear and complete account of the various methods hitherto used or proposed for the detection of the presence of arsenic in medico-legal proceedings. They consider that Marsh's test is not the most certain, but give the preference to the precipitation with sulphuretted hydrogen, and the reduction of the arsenic from the sulphuret. Their mode of proceeding is succinctly as follows:—

The suspected mass, in which arsenious acid in its solid state shall not have been found (a stomach with its contents for instance), after having been cut in pieces, is placed in a tubulated retort with an equal weight of muriatic acid (which must have been previously ascertained to be free from arsenic by testing it with sulphuretted hydrogen), the retort connected with a receiver containing a little water, and the greater part of the liquor distilled off in a bath of chloride of calcium, until in fact the mass in the retort assumes the consistence of pap. After it has become cool, this is carefully mixed with twice its weight of strong alcohol (alcohol of about 10 per cent.), and set aside for some time; after which the solution is brought on a filter, and the residue well washed with alcohol.

The alcohol is now distilled off from this filtered solution, and the residue added to the acid liquor which passed over into the receiver during the first distillation, and which might possibly contain a little chloride of arsenic.

The liquid is now treated with sulphuretted hydrogen, and allowed to stand in a vessel, lightly covered, at a temperature of 120° to 140°, until all excess of sulphuretted hydrogen has evaporated. It is then filtered, and the sulphuret of arsenic received on the filter. Should it be too small a quantity to be removed from the filter, it must be dissolved in caustic ammonia, the solution evaporated to dryness in a porcelain capsule, and the residue treated with nitric acid of 1·34 to 1·40 spec. grav., and again evaporated to dryness; thereupon the mass is mixed with from 6 to 8 times its weight of well carbonized cream of tartar (black flux), and the mixture made into a paste with a little water, and spread upon a strip of window-glass of about 1½ to 2 lines broad, and well dried.

This is now placed in a glass tube of 3 lines diameter, which is drawn out at one end into a finer tube, and hydrogen gas passed through it, which has been previously led through a tube containing cotton-wool, moistened with a solution of corrosive sublimate, lightly pressed into it, and then through a tube filled with chloride of calcium; the spot where the little strip of glass is lying is then heated to redness, whereby the arsenic is reduced, and is deposited in the usual manner.

Should the precipitated sulphuret of arsenic be in greater quantity, 1 or 2 grs. for instance, it is dissolved in a warm dilute solution of caustic potash, and a quantity of nitric acid equal to the potash contained in the solution added, the whole dried, and the residue fused; it is then dissolved in water, saturated with acetic acid, boiled to expel the carbonic acid, precipitated with lime water, and the arseniate of lime collected on a filter, and mixed, while still moist, with four times its weight of a coarsely-powdered mixture of borax and charcoal, which has been previously heated to redness, then placed in a sublimation tube, and heated by the blowpipe-flame until the arsenic is reduced.

The following are the conclusions they draw from their researches:—

1st. Arsenic exhibits in its metallic state such characteristics as are fully sufficient to demonstrate that it is arsenic.

2nd. For this purpose the most trifling quantity is required, a quantity so small as to be almost imponderable.

3rd. The reduction of the arsenic therefore to its metallic state is absolutely necessary in medico-legal researches, in order to prove that the tested mass contains arsenic.

4th. The action of other reagents, however it may agree with the general characteristics of arsenious acid, can never be such as to render the reduction unnecessary.

5th. When the examination for arsenic is undertaken directly with organic substances, the test of Marsh requires many precautions and the greatest care. The process with sulphuretted hydrogen above described is therefore better and more certain.

6th. If Marsh's test be used, the best method of reducing the metal from the arseniuretted hydrogen is that of Berzelius, by means of oxide of copper (*Jahresbericht*, 1840, S. 193-198).

7th. By boiling with hydrochloric acid, all the arsenic is extracted; the tedious preparation with caustic potash or nitric acid is therefore unnecessary.

8th. Sulphuretted hydrogen precipitates the *whole* of the arsenious acid dissolved in the hydrochloric acid, in the form of sulphuret of arsenic.

9th. The reduction of arsenic from its combination with sulphur, according to the method long ago proposed by Berzelius, should be preferred to Marsh's test, and zinc perfectly free from arsenic is not even necessary.

10th. The treatment with nitric acid by Orfila's method is difficult and uncertain.

11th. Bones in their normal state contain no arsenic.

12th. The arsenic received into the organization of a living body does not remain, but is gradually expelled from it, unless life become extinct.—Berzelius's *Jahresbericht*, xxiii.

Cinchona Pitoya.—M. Muratori states that he has found in 12 ounces of this bark 17 grs. of quinine, 80 grs. cinchonine, 18 grs. of a peculiar substance, 3 drs. 24 grs. tannin, 33 drs. 36 grs. cinchona red, 1 dr. 8 grs. quinate of lime and quinic acid, 7 drs. gum, and 6 oz. 1 dr. 21 grs. woody fibre. This would prove that the *Cinchona Pitoya* of the Italians is a true Cinchona; also that it is very different from the bark known under that name in Germany, France, and England.—Buch. *Rep.* 31. p. 338.

Infusum Sennæ Frigidum. *By Mr. E. Lund.*—It is commonly objected to the use of senna, that it invariably causes *tormina* or griping. It is to this well-known defect that I would now more particularly direct your attention, and I hope to be able to show that it is entirely the result of certain chemical changes which the infusion, as usually prepared, is very liable to undergo; and moreover I am of opinion that so long as the soluble substances are held exactly in the same state of combination as existed in the leaves, *tormina* will not be produced. But the true cause is undoubtedly to be sought for in the oxygen of the atmosphere combining with a portion of the albuminous matter which is always present, converting it into a body whose atoms are in a state of transposition, which in its turn will act as a nitrogenised ferment, and excite similar changes among the other ingredients, the amount of heat employed appearing to exert a decided influence over this disturbance, for the cold infusion will keep much longer than that made with hot water; but if a small quantity of it be retained only for a short time at the temperature of 212°, a separation of albuminous matter takes place, and then it passes quite as readily into a state of decomposition.

My endeavour therefore has been completely to prevent the occurrence of these changes, or at least to arrest them in their earliest stage; and the plan I have to recommend for this purpose is one which I have found very successful, and at the same time attended with but little trouble. It is as follows:

Take 7½ oz. of *Fol. sennæ Alex.*, pack them carefully in any apparatus usually made use of in preparing infusions by displacement, pour upon them 23 oz. of cold distilled water, and macerate in a cool place for 10 hours, frequently drawing off from the bottom, and replacing at the top of the apparatus about 3 or 4 oz. of the liquid. At the end of that time the leaves must be submitted to powerful pressure, when 18 oz. of a dark-coloured infusion of 1045 spec. grav. should be procured; this must be mixed immediately with 2 oz. of *Sp. Vini rect.*, and after the precipitate which it produces has somewhat subsided, the whole must be filtered through paper.

A cold infusion made in this manner, if no delay be allowed in adding the spirit, will keep for a great length of time at ordinary temperatures, without the slightest appreciable disengagement of gas, or discernible change in smell or taste; a slight deposition of gummy matter is slowly formed, which I have ascertained to be unattended by any absorption of oxygen, the precipitate being quite inert, and generally adhering so firmly to the sides of the vessel in which it is kept as not to interfere with the transparency of the infusion. With respect to the dose of it, 2 fluid drachms will be found equivalent to 1 oz. of the *Infus. sennæ comp.* of the London Pharmacopœia. 500 grs. of it, evaporated very carefully at a gentle heat until they ceased to lose weight, left 8·5 per cent. of solid extract, whereas an equal weight of the common infusion

* Das Arsenik, seine Erkennung und sein vermeintliches Vorkommen in organisirten Körpern. Von Dr. A. Duflos und A. G. Hirsch. Breslau, 1842.

gave 3·6 per cent. In estimating, however, the strength of these two preparations, by comparing the amount of solid matter left after each evaporation, some allowance must be made for the quantity removed during the filtration of the infusion; and I think you will admit, that in this, as in all similar questions relating to the doses of medicines, experience, together with an attentive consideration of the varied circumstances of each individual case, are alone to be relied on as our best and surest guides.

On the formation of Hydrocyanic Acid in the preparation of Sweet Spirits of Nitre. *By John Dalpiaz.*—The author having had occasion to prepare some sweet spirits of nitre according to the proportions prescribed by the London Pharmacopœia, found that the product gave with nitrate of silver a flocculent white precipitate, which presented all the characters of the cyanide of that metal. The formation of hydrocyanic acid under these circumstances is an interesting fact, and M. Dalpiaz resolved to investigate the influence which various proportions of acid and alcohol might have on this phænomenon at a temperature more or less elevated.

He distilled in the water-bath a mixture of

Alcohol of spec. grav. 0·848	360 grms.
Distilled water	180 ..
Nitric acid of spec. grav. 1·35	90 ..

The products were received separately in five different portions, all afforded a precipitate with nitrate of silver, which weighed altogether 0·65 grm.

A fresh mixture of alcohol of sp. gr. 0·829 100 grms.
Nitric acid of spec. grav. 1·35 ..... 100 ..

was heated very slowly in a large retort. It had scarcely boiled two minutes, without the solution of nitrate of silver, in which the products were received, presenting the least opacity, when all at once so large a quantity of hydrocyanic acid was disengaged that the liquid became in a moment thick and milky. Unfortunately, a few instants after the retort burst, and diffused vapours so strongly charged with hydrocyanic acid, that the author was obliged to quit the laboratory. This experiment not having afforded a definite result, it was repeated, the retort being sprinkled with cold water during the operation, in order to moderate the action. This time the amount of hydrocyanic acid disengaged was very small, and it is probable that none would have been formed had the re-action been slower. The elevation of temparature is therefore favourable to the production of hydrocyanic acid.

M. Dalpiaz concludes his note by observing that he had very seldom succeeded in detecting hydrocyanic acid in the nitrous æthers of commerce, but he always found in them a considerable amount of formic acid.

MM. Bernard de Rosne and Chatin have repeated and extended the above experiments. They find that hydrocyanic acid is produced in considerable quantity during the re-action of nitric acid on the fatty bodies. They have also confirmed the statement, that not the least trace of a cyanogen compound is formed when one portion of alcohol is distilled very carefully with two portions of nitric acid.

The formation of hydrocyanic acid during the re-action of nitric acid on certain organic substances is not a new fact. M. Gauthier de Claubry in 1839 demonstrated the presence of hydrocyanic acid in the alcohol obtained in the preparation of the fulminates; and last year M. Sobrero showed that it was likewise formed when nitric acid was distilled with the essential oil of beech and with various volatile oils, and even with several resins.* Long since M. Thenard announced that this acid was one of the products resulting from the action of nitric acid on sugar, gum, &c. Nevertheless the precise observations of M. Dalpiaz are of considerable interest.—*Journ. de Phar.* for March 1844.

On the preparation of Tannine. *By M. Dominé.*—The author, after detailing a series of experiments performed in the laboratory of M. Soubeiran, with a view to ascertain the best process for obtaining the above substance, recommends the following as being the most constant and the most productive:—

Expose the powdered galls in a cellar, and allow them to absorb *moisture from the atmosphere for three or four days;* convey them into a wide-mouthed vessel, which can be closed hermetically; a quantity of ordinary æther of 0·76 spec. grav. is poured over the galls, so as to form a soft paste. It is well mixed, which should be done very quickly by means of a wooden spatula, and the vessel closed. After four-and-twenty hours the substance is placed on a square piece of strong linen, and quickly subjected to the gradual action of a good press. The syrupy liquid which escapes is spread upon plates by means of a brush, which are then conveyed into a warm chamber, heated to from 104° to 113°. The substance swells considerably, and leaves the tannine in the light laminæ, scarcely coloured.

On the Preparation of Iron-Alum.—M. Bolley observes, that frequently in preparing iron-alum the basic double salt of Maus $2SO^3, F^2O^3+2(SO_3, KO)+6HO$ is obtained, which crystallizes in olive-green hexangular tablets and columns. It forms when the solutions are crystallized hot; the yellow cold solution of iron-alum becomes dark red on being warmed. It likewise appears as if the octahedrons of the iron-alum effloresce in the direct light of the sun, and are converted into that double salt. This decomposition results from the great tendency of the potash to form bisulphate, thereby rendering the peroxide of iron-salt basic. A large quantity of bisulphate of potash occurs in the mother-ley. The olive-coloured compound affords on boiling a still more basic yellow and insoluble salt. The latter contains variable quantities of potash-salt, but equal equivalents of sulphuric acid and peroxide of iron. The author has examined a pale green salt resembling green vitriol, which had been deposited in the vessels of a chemical manufactory in which formerly iron-alum had been prepared, and which had been exposed to the atmosphere for many years. It contained 17 per cent. protoxide of iron, 24·4 water, 38·4 sulphuric acid, and 20·2 potash, therefore = FeO, SO^3+KO, $SO+6HO$. This double salt might perhaps, on account of its greater stability, be employed instead of green vitriol in many cases where a deal depends on the constant amount of oxygen and water, as for instance, in chlorometry.—*Jahrb. für Prakt. Pharm.*

On Rad Galangæ. *By A. Vogel, Jun.*—M. Buchholz found in *Rad. Galangæ*, essential oil, a soft resin, extractive substance, gum and bassorine. The author found moreover starch and fat oil. Cold water extracts gum, chloride of calcium, chloride of potassium and gypsum; boiling water affords an extract which contains much starch, gives a green colour with persalts of iron, and which on evaporation leaves a brown horny residue. Boiling alcohol gives a yellow brown tincture, which on evaporation leaves a soft residue, possessing the odour and taste of the root, which yields very little to water. Boiling æther produces a yellow solution, which on evaporation affords a brown extract and a yellow fat oil, in which some essential oil is dissolved. The fat oil may be separated by pressure between bibulous paper into a solid and a liquid portion.

On distilling the root with steam, a colourless essential oil is obtained, which dried, and dehydrated by means of chloride of calcium, consisted of—

Carbon	74·923	74·881
Hydrogen	11·557	11·548
Oxygen	13·520	13·571
	100·000	100·000

approaching therefore in its composition to cajuput oil.

The water separated from the essential oil is neutral, has the odour and taste of the root, and gives with acetate of lead a precipitate of carbonate of lead. Treated with muriatic acid and evaporated, it leaves a saline, entirely volatile residue, from which potash liberates ammonia. The water therefore contains carbonate of ammonia, the formation of which is probably owing to some nitrogenous body contained in the root.—*Buch. Repert.*, xxxiii. p. 19.

On the Preparation of the Hydrated Peroxide of Iron and of Liquor ferri acetatis. *By M. Trautwein.*—According to the author it is requisite, in the preparation of *Liquor ferri acetatis*, that the liquids employed in the precipitation of the hydrated peroxide of iron should possess the requisite degree of dilution, and that an excess of acetic acid should be avoided for dissolving the hydrate. The various hydrates of the peroxide of iron are not always sufficiently distinguished; the hydrate $2Fe^2O^3+3HO$ is not the one that should be employed as an antidote against arsenic, nor in the preparation of the *Liquor ferri acetatis*, but the hydrate Fe^2O^3+3HO, which when well dried contains 27 per cent. water.

This hydrate is obtained by diluting ʒ 6 *Liq. ferri sesquichloridi* of 1·545 spec. grav. with ʒ 90 of distilled water, then adding 6 oz. of cautic potash of 1·333, diluted with 80 oz. of water, shaking until the precipitate formed has redissolved to a clear solution, and now precipitating by the careful addition of an equally dilute solution of potash. The brownish-red gelatinous precipitate is thrown on to a strainer, and the chloride of potassium removed by washing; it is then reduced by pressure to within 3 to 6 oz., or in case it is to be preserved as an antidote, only to 12 oz. This residue is dissolved in 3½ oz. of acetic acid of 1·05, so much water being added that the whole amount to 12 oz. The solution is poured through a piece of linen; it is perfectly clear, and contains one-twelfth iron. It is best to add immediately the amount of alcohol prescribed in preparing the tincture, and to preserve it in this state, adding the acetic æther on filling the shop bottles. The tincture so obtained contains one-sixteenth iron or one-twefth oxide, and has a spec. grav. of 1·055 to 1·06. One drop imparts a beautiful wine-yellow colour to 2 oz. of water. It is not easily decomposed, and even on being heated only becomes transitorily thicker.

The author believes that the iron does not exist as oxide in Klaproth's tincture when it has been correctly prepared, but is in a state of hydrate, at least for two-thirds. The above-mentioned hydrated peroxide of iron dissolves readily in dilute acids, forming tribasic compounds, which on being heated generally decompose into the neutral salt and oxide, which is rendered immediately perceptible by an alteration of the colour from a dark reddish-brown to a yellowish-brown. Solutions which contain the hydrate afford a more voluminous precipitate with tannine than those containing the peroxide.—*Buch. Repert.*, xxxii. p. 1.

Observations on Quinovine. *By M. Winckler.*—The author has prepared this alkaloid from 104 oz. of light *Jean Cinchona*, according to Manzini's process. The lime precipitate formed in the acid extracts was very voluminous, the alcoholic extract of an intense greenish-yellow colour; on evaporation, the crude alkaloid (6 drachms) was obtained in the form of a brownish-yellow, very bitter resin, the purification of which was rendered extremely difficult from the presence of a yellow resin; so that after dissolving in acetic acid, treatment with oxide of lead, basic acetate of lead and animal charcoal, precipitating the decolorised filtered solution by ammonia and re-crystallization from alcohol, only 60 grs. of pure alkaloid were obtained.

M. Winckler has found this alkaloid, upon a most careful comparison, to be identical with cusconine or aricine, nor do the analyses of the two differ very much. Manzini found in quinovine 69·92 C, 7·04 H, 7·39 N, and Pelletier in cusconine 70 C, 7 H, 8 N.—*Buch. Repert.*, xxxi. p. 249.

Preparation of Tartarus Ammoniatus. *By M. Veling.*—To obtain a perfectly neutral salt in beautiful crystals, I prepare a highly-concentrated solution of pure bitartrate of potash with *Ammon. carb.*, add a slight excess of *Liquor ammon. caust.*, and pour over it twice the amount of highly-rectified alcohol, as in the prepartion of *Cupr. sulph. ammon.*; close the vessel with moist bladder and let it stand. If the salt is not wanted in crystals, it is only requisite to shake the alcohol with a saline solution. It causes much less trouble to re-obtain the alcohol than to produce the preparation in the ordinary manner, without there being equal certainty of obtaining it perfectly free from every objection.—*Arch. der Pharm.*, Feb. 1844.

HOMŒOPATHIC MATERIA MEDICA.

(From Homoeopathy Unmasked—Menzies').

The branch of medicine in which the greatest innovation has been made by Homœopathy, is that of Materia Medica, which treats of the character, preparation, selection, and application of remedial agents; and, accordingly, it is in this department that we find the unphilosophical character of that pretended science most fully developed, and the ridiculous absurdities in which all its adherents must profess their belief most conspicuously displayed.

Proceeding on the system which we have already exposed, the homœopathists have unsparingly attacked the existing Materia Medica, and seem to have thought that little more was necessary to establish the character of theirs. It is singular, however, that so unscrupulous a defender of homœopathy as Dr. Black, should not have been aware, that in the chapter of his book where he explains the homoeopathic system, he has indirectly admitted that it possesses all the defects of that which it is proposed to supersede, and that on these it has engrafted some absurdities peculiarly its own.

The great advantage to be gained by the introduction of the homœopathic law, and the compensation offered to those who are willing to embrace all its contradictions is, that it proposes "a simple, certain, and universal law" for the discovery of the true (pure) action of remedies. For this purpose it was that Hahnemann "conducted a course of experiments upon himself and friends, patiently

* See vol. i. p. 229.

enduring the annoyance of a rigid rigimen, and the severe suffering produced by the medicines."*

His conscience would no longer allow him "to give actively dangerous substances in obedience only to the vague directions of books." He abandoned medicine until the results of his experiments satisfied his conscience, and enabled him to resume his professional career. And what is the character of these experiments, as given by one of his warmest supporters? Dr. Black, in speaking of the fruit of Hahnemann's labour, and suffering, and toil, confesses, that "he is not ignorant, that Hahnemann, commingling the symptoms of the various experimenters without noticing what doses were employed, what symptoms were primarily manifested, in what groups or orders of succession they were observed by different individuals, and the slight regard paid to the objective symptoms, renders it impracticable to know the organ primarily affected, the generic relation of many individual symptoms, or, what is most important, the character, the total operation of the medicine; so that it may be viewed as a difficult task, for one who refers to these records of symptoms, to select the right remedy," p. 59. In page 46. Dr. Black observes, of the identical experiments which he has so characterised, that "the purest proofs, those best ascertained, and those to which Hahnemann and his school appeal, are the numerous experiments performed by himself and followers."

And how is the "ignorance" in which the homœopathists admit that they are left by "these purest proofs," to be corrected in practice?

"After *years' of experience* at the bed side, with the remedies thus represented, homœopathists become gradually acquainted with the characters of each, its total operation with its particular tendencies," p. 60.

So it is the homœopathists, after all, who adopt, as "another field for experiment, the unfortunate patient," while thus *gradually* acquainting themselves with the effects of their remedies, p. 49. But as they themselves say, "Even granting that this were merciful and proper, it still would be defective; for the class of diseases which present themselves as constantly the same, is exceedingly small; it is like judging the weight of bodies by putting them into a false balance," p. 9. The chief difference then is this:—The allopathists, having ascertained "that certain of the inferior animals are affected by almost all poisons in the same way as ourselves,†" and having fixed experimentally the slight peculiarities which exists, test each unknown substance upon them, *in doses capable of producing an undoubted effect;* and, subsequently, still further confirm this experience by careful trials with it in disease. The homoeopathists, on the other hand, disdaining experiments on the lower animals, test their medicine on the healthy subject, and dare not, of course, give active substances in doses of acknowledged power. Hence the confusion which renders it "impracticable for them to know the character, the total operation of the medicine; and makes it a difficult task for them to select the right remedy." It is this that drives them in their *uncertainty* "to *experiment* on the unfortunate patient," who must, therefore, too often suffer from this confusion and ignorance.

It is customary in medicine to combine, in one prescription, several substances, none of which are capable singly of producing the effect desired,‡ and against this system Hahnemann indulges in three pages of ponderous sarcasm, which forcibly reminds us of the fable of the ass, which tried to imitate the gambols of the lap-dog. So enamoured is Dr. Black of the freaks of the "double-head" in his playful moments, that he transfers the whole to his own work; would that our limits permitted us to do the same! Decidedly, as we advocate simplicity in prescriptions, we cannot see why, for example, the action of a purgative should be *necessarily* impeded by some substance given along with it, to counteract its griping effects; or that of an opiate, by a combination which obviates its constipating powers; indeed, we know that it is not.

But all the ridicule which Hahnemann employs might be turned with equal effect against his own school; for, if there be a danger in combining three medicines, producing different effects, do we escape it by prescribing one which produces *nine hundred and thirty* different symptoms? As a necessary result of the great number and conflicting character of many of the symptoms, which these (*simple!*) substances produce, we find one of them, nux vomica, is used in such different diseases as the following:—Chronic vomiting, headache, chronic cough, diarrhœa, constipation, piles, dyspepsia, &c. &c. Nay, as if determined to contradict everything he ever writes, Dr. Black illustrates his principle of simple formula by such a report and prescription as the following:—

August 26.—A great deal better. Piles have almost entirely disappeared. Ant. Crud, followed by Lach, Sepia, Sulph. Nux v". (Disp. Rep., p. 17.) *Five different substances!!* and this, notwithstanding Hahnemann has declared, that "to prescribe compound prescriptions is the height of empiricism!!" We were not before aware, in what precise place in the scale the homœopathists put themselves.

Again, it is asserted, that in the allopathic method, "no one law of therapeutics is steadily acted upon," and we are taunted with the differences that have prevailed among the practitioners of medicine; it would appear that even the profession of a "universal law" affords no security against this, for the dose in which their remedies are to be administered "is a question still, in a measure, *sub judice*, and which has given rise to many an unseemly discussion; the acrimony of which would lead us to suppose, that it was a vital point in homœopathy, and that the selection of the dose, instead of being subordinate, was paramount in importance to that of the remedy," p. 146.

Dr. Black laudably attempts to act as peace-maker, declaring, "That where the medicine is well chosen, the difference of dilution is really very imperceptible, and the thirtieth succeeds as well as the third," p. 146. We have no doubt it does, and think it

> "Strange such difference should be,
> 'Twixt tweedle-dum and tweedle-dee."

But it is in the system of infinitesimal doses that we find the fullest development of homœopathic absurdities. An admirable synopsis of the views of Hahnemann on this subject, is given by Mr. Pereira, which we subjoin as the most concise statement we have met with.

The homœopathists believe, that "The effects of medicines do not decrease in proportion to the diminution of the dose. Thus eight drops of a medicinal tincture do not produce four times the effect of two drops, but only twice; hence he uses exceedingly small doses of medicines.

"Proceeding gradually in his reductions, he has brought his doses down to an exiguity before unheard of, and seemingly incredible. The millionth part of a grain of many substances, is an ordinary (homœopathic) dose; but the reduction proceeds to a billionth, a trillionth, nay to the decillionth of a grain, and the whole materia medica may be carried in the waistcoat pocket."

"The following is the method of obtaining these small doses:—Suppose the substance to be a solid; reduce it to a powder, and mix one grain of it with ninety-nine grains of sugar of milk,* this constitutes the *first attenuation.* To obtain the *second attenuation,* mix one grain of the first attenuation with a hundred grains of sugar of milk. The *third attenuation* is produced by mixing one grain of the second attenuation with ninety-nine grains of sugar of milk. In this way he proceeds until he arrives at the *thirtieth attenuation.* The following table will show the strength of the different attenuations, with the signs he employs to distinguish them:—

Signs.		*Strength of One Grain.*
1. First attenuation,	.	one hundredth part of a grain.
2. Second, "	.	one thousandth "
I. Third, "	.	one millionth "
II. Sixth, "	.	one billionth "
III. Ninth, "	.	one trillionth "
IV. Twelfth "	.	one quadrillionth "
V. Fifteenth, "	.	one quintillionth "
VI. Eighteenth, "	.	one sextillionth "
VII. Twenty-first "	.	one septillionth "
VIII. Twenty-fourth "	.	one octillionth "
IX. Twenty-seventh "	.	one nonillionth "
X. Thirtieth "	.	one decillionth "

Here is a tabular view of the doses of some substances employed by the homœopathists:—

Charcoal, one or two decillionths of a grain.

Camomile, two quadrillionths of a grain.

Nutmegs, two millionths of a grain.

Tartar emetic, two billionths of a grain.

Opium, two decillionths, of a drop of a spirituous solution.

Arsenious acid, one or two decillionths of a grain.

Ipecacuan, two or three millionths of a grain.

These doses are given in pills (globuli), each about the size of a poppy seed."*

To doses of medicinal substances such as these are the life of patients is to be intrusted when suffering under disease!

Dr. Black seems quite aware, that in those who are acquainted with the powers of medicines, such a system will excite only derision, and accordingly confesses. "That the employment of minute doses in homœopathic practice has tended much to retard its progress, and has been frequently a stumbling block to those who might, otherwise, have been inclined to examine the subject," p. 81. Nay, he even condescends to hint, "That homœopathy and the employment of minute doses are two separate things." So that every disciple can have his dose of homoeopathy accurately proportioned to his gullibility.

But we confidently assert, that homoeopathy *cannot be practised* if its professors are allowed to employ doses which have an *undoubted effect* on the animal economy, because, were they to give to a patient labouring under an acute disease, any medicine which *really* had the power of producing a similar disease,† the probable consequence would be, a fearful augmentation of the symptoms, or in a severe disease, death itself. This is no hap-hazard statement, but is deliberately given as the experience of the homœopathists themselves.

"With large doses, patients may be treated homœopathically, BUT THEN WE MAY FREQUENTLY EXPECT A POSITIVE INCREASE OF THE DISEASE, OR EVEN DEATH. The *experience* of such painful and dangerous aggravations, in no case necessary to cure, led Hahnemann to employ minute doses," p. 82.

That is to say, that Hahnemann practising homœopathically with medicines, which are admitted to be capable of producing some effect on the human body, caused a "positive increase of the disease of his patients, and in some cases even death;" and, therefore, was driven to the employment of *doses, which the chosen advocates of homœopathy admit are inert.*

Professor Döppler has reviewed the subject; and, as his conclusions are quoted by Dr. Black, we need go no farther. The learned professor attempts to show, that the "superficies of medicines is increased by trituration;" and "proceeding on the moderate assumption, that by each trituration the particles are reduced to the hundredth part of their previous size, we shall find," he says, "the surface of a medicine, originally the cube of an inch, will become at the third trituration equal to two square miles; at the fifth, to the Austrian dominions; at the sixth, to the area of Asia and Africa together; and, at the ninth, to the united superficies of the sun, the planets, and their moons." (Black, p. 88.)

What a pity the learned Döppler did not give a physical expression to the decillionth!

Döppler concludes, "We have said sufficient to show, that if medicines act in virtue of their mass, the doses used in homœopathy must be quite inert; but if in proportion to their surface, they may be of tremendous potency," (p. 88.)

If their potency be tremendous, why are they safer than ordinary doses given homœopathically; and how was it that Hahnemann killed his patients with doses of ordinary power, and found it safe to administer *the same remedy* after he had conferred on it "this tremendous potency?"

But the homœopathists, when they tell us that "it has been undeniably proved by the experiments of Hahnemann and the experience of his followers, that the latent power of medicine is developed by trituration and solution," (Black, p. 306), evidently endeavour to make the public credit what they do not believe themselves, and therefore merit the title of impostors as well as empirics; for if they really believe that their medicines are more potent than they appear, why tell us to bear in mind—

"That when medicines are to act on that part of the organism which is already affected, as in homœopathy, the doses must be proportionally small to what they would be, were the medicines to act on a part which is perfectly sound, as in allopathy." p. 83.

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* Black, p. 19. Russel, Brit. Journ of Hom. p. 3.

† Christison on Poisons, p. 64.

‡ The modifications which these medical combinations are used to produce, are clearly laid down by Dr. Paris. See Appendix (C).

* "The sugar of milk (saccharum lactis) is generally brought from Switzerland, where it is prepared by the evaporation of the whey obtained after making cheese. The purest is crystallized, hard, colourless, slightly sweet, and inodorous. Other specimens contain more or less of animal matter."—Black, p. 72.

* Pereira, Materia Medica, vol. i. p. 44.

† By the admission of the homœopathists themselves, their medicines *when given in the small doses in which they use them,* have no power to produce *any* change in the healthy body.

THE MEDICAL TIMES.

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Purgatives: Sulphate of Potass; Preparation of the Hyposulphite of Soda; Therapeutic Properties of the Hyposulphite of Soda; Magnesian Mixture; Magnesian Draught; Report on Gaseous Sea Water; Sea Bathing; Aloetic Ointment; Purgative Elixir of Clary.—Antiphlogistics: Syncope Employed as an Antiphlogistic; The Treatment of Psoitis; Poudre Content; Quinine; Large Doses of Sulphate of Quinine in the Treatment of Acute Articular Rheumatism; Febrifuge Gaseous Water; Anti-Arthritic Pills; Febrifuge of Metzinger; Therapeutic Employment of Variolaria.—Chalybeates: Contra-indication of Ferruginous Preparations; Sulphate of Iron, its Use in the Treatment of Varus Mentagra and Gutta Rosea; First Solution; Second Solution.—Astringents: Vaccinium Myrtillus, the Extract of the Berries in Diarrhœa; Alcoholic Tincture of the Vaccinium Myrtillus; Syrup of the Vaccinium Martillus; Ptisan of Polygonum Aviculare; Collyrium of Tannin; Collyrium of Rhatany; Ointment against Ringworm; Ranque's Plaster.—Alteratives, Substitutives: Iodhydrargyrate of the Ioduret of Potassium; Solution; Pills; Ointment; Gargle; Syrup of the Iodhydrargyrate of Potassium; Compound Anti-Syphilitic Syrup; Normal Mercurial Liquor; The Proto-Ioduret of Mercury; Hydrargyro-Ferruginous Pills; Arabic Treatment; Arabic Opiate; Arabic Pills; Sudorific Ptisan; Collyrium of the Cyanuret of Mercury; Treatment of Ulcerated Keratitis, and of Senile Iritis; Lotion against Vegetations on the Penis; Alcoholic Mercurial Lotion; Rational Liquid Proto-Nitrate of Mercury; Escharotic Solution of Freyberg; Seyffer's Powders; On the Employment of Chloro-Iodurct of Mercury, and on its Preparation; Hydrargyro-Belladonna Ointment; Hanay's Ointment; Paste against Epididymitis; Baths against Mercurial Salivation; Nitrate of Silver; Pills; Intestinal Injection; Vesical Injection; Ointment; Use of the Chloruret of Silver; Pills of the Ioduret of Silver; The Use of Nitrate of Silver in Ophthalmia; Treatment of Urethral Blenorrhagia; Argentine Injection; Injection of Acetate of Zinc; Astringent Injection; Employment of the Nitrate of Silver in Cauterizing the Granulations of the Cervix Uteri; Ointment of the Nitrate of Silver; Anti-Epileptic Powders.—Arsenical Preparations: Oxide and Cyanuret of Cacodyle; Use of Fowler's Solution in Squamous Diseases; Paludal Miasma; Arsenical Solution; Quinino-Arsenical Mixture; Cupro-Arsenious Injection . . . . . 33—38

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MEMORANDA FOR DRUGGISTS,

COMPILED FROM VARIOUS SOURCES.

ACETATE OF AMMONIA (MINDERERUS SPIRIT).—Muriate of ammonia, 279 parts; acetate of lead, 1000 parts. Make a saturated solution of each, mix while hot, and filter.

ACETATE OF MORPHIA.—Morphia, 6 drachms; acetic acid, 3 fluid drachms; distilled water, 4 fluid ounces. Dissolve, then evaporate with a gentle heat, and crystallize. Dose—one eighth to one grain.

PURE CONCENTRATED ACETIC ACID.—Fused acetate of potash, 10 pounds; strongest sulphuric acid, 5 pounds. Distil slowly from a glass retort into a glass refrigerator. Re-distil from a little acetate of lead, to deprive it of a small quantity of sulphurous acid that contaminates it; the product will then be very pure.

ACETIC LOZENGES.—White sugar, 7 pounds; strong vinegar to mix; a little gum may also be used.

PURE ALBUMEN.—White of egg, 1 part; strong alcohol, 11 parts. Mix, agitate, and collect the precipitate.

ALMOND BLOOM.—Brazil dust, 1 ounce; cochineal, a quarter of an ounce; water (hot), half a gallon. Steep for two or three days, then strain, and add isinglass, 1 drachm; gum arabic, 2 drachms; spirit, 2 ounces; essences to perfume.

SWEET ALMOND LOZENGES.—White sugar, 3 pounds; starch, 1 pound; blanched almonds, 2 pounds. Beat into a thick paste, then roll it into a cake, and cut it into lozenges.

LIQUID ALMOND PASTE.—Bitter almonds, blanched, 4 parts; sweet almonds, blanched, 4 parts; oil of almonds, 1 part; juice of lemon, 6 parts; spirit, 1 part; rose water, 2 parts. Reduce the almonds to the state of milk, then add the other ingredients, and strain.

BITTER ALMOND SOAP.—Fine, hard, white soap, 100 pounds; essence of bitter almonds, $1\frac{1}{3}$ per cent. Treat them as for cinnamon soap.

ENGRAVING IN ALTO RELIEVO.—In the common operation of engraving, the desired effect is produced by making incisions upon the copper-plate with a steel instrument of an angular shape, which incisions are filled with printing ink, and transferred to the paper by the pressure of a roller, which is passed over its surface. There is another mode of producing these lines or incisions by means of diluted nitrous acid, in which the impression is taken in the same way. Another method of engraving is done upon a principle exactly the reverse, for instead of the subject being cut into the copper, it is the interstice between the lines which is removed by diluted aqua-fortis, and the lines are left as the surface, from which the impression is taken by means of a common type-printing *press*, instead of a copper-plate press.

This is effected by drawing with common turpentine varnish, covered with lamp-black, whatever is required upon the plate, and, when the varnish is thoroughly dry, the acid is poured upon it, and the interstice of course removed by its action upon the uncovered part of the copper. If the subject is very full of dark shadows, this operation will be performed with little risk of accident, and with the removal of very little of the interstice between the lines; but if the distance between the lines is great, the risk and difficulty is very much increased, and it will be requisite to cut away the parts which surround the lines with a graver, in order to prevent the dabber with the printing ink from reaching the bottom, and thus producing a blurred impression. It is obvious, therefore, that the more the plate is covered with work, the less risk will there be in the preparation of it with the acid after the subject is drawn, and the less trouble will there be in removing the interstice (if any) from those places where there is little shading.

AMALGAM FOR THE CUSHIONS OF ELECTRICAL MACHINES.—Zinc, 2 parts; tin, 1 part; mercury, 5 parts. Mix. Rub the cushions with a mixture of tallow and bees'-wax before applying the amalgam.

AMALGAM FOR VARNISHING PLASTER FIGURES, &c.—Tin, mercury, bismuth, equal parts; fuse and cool, then make the amalgam into a varnish with white of egg.

CARBONATE OR SESQUICARBONATE OF AMMONIA.—Dry chalk, 3 parts; sal ammoniac, 2 parts. Sublime.

AMMONIAC PLASTER.—Gum ammoniac, 1 pound; distilled vinegar, 1 pound and a half. Evaporate to a proper consistence.

CANDIED ANGELICA.—Boil the angelica for a quarter of an hour in water, then take it out, dry it, and boil it in thick syrup; drain and dry.

ANISATED BALSAM OF SULPHUR.—Balsam of sulphur, 24 parts; turpentine, 24 parts; oil of aniseed, 2 parts. Mix with heat.

OIL OF ANISEED (FACTITIOUS).—Oil of aniseed, 10 parts; rape oil, 15 parts; spermaceti, 1 part. Mix with heat in a close vessel.

ANTI-FERMENT FOR CIDER, BEER, WINE, &c.—Sulphite of lime, 1 part; powdered mustard seed, 2 parts. Mix.

ASIATIC DENTIFRICE.—Armenian bole, 3 parts; prepared chalk, 2 parts; ochre, one part; pumice stone, 1 part. Reduce to fine powder, sift through lawn, and scent with musk.

ASSAFŒTIDA PLASTER.—Diachylon, 2 pounds; assafœtida, 2 pounds; galbanum, 1 pound; yellow wax, 1 pound. Mix. For hysterics, flatulence, &c., applied to the navel.

BISULPHURET OF TIN.—Tin, 12 parts; mercury, 3 parts; sulphur, 7 parts; sal ammoniac, 3 parts. Mix, and expose them in a mattrass to a gentle heat in a sand-bath, then gradually and cautiously raise the heat a little, and calcine for two or three hours.

BALLS FOR REMOVING GREASE AND PAINT SPOTS FROM CLOTH, &c.—Fuller's earth, 30 parts; French chalk, 1 part; yellow soap, 20 parts; pearlash, 15 parts. Make into a paste with spirits of turpentine, and give it a slight colour with a little yellow ochre, then cut it into cakes.

BALSAMIC VINEGAR FOR SICK CHAMBERS, &c.—Rue, sage, rosemary, lavender, cassia, and cloves, of each 1 ounce; camphor (powdered), 2 ounces; strong vinegar, half a gallon. Steep for one week.

TO TAKE IMPRESSIONS FROM COINS, &c.—Make a thick solution of isinglass in water, and lay it hot on the medal; let it remain for twelve hours, then remove it, breathe on it, and apply gold or silver leaf on the wrong side. Any colour may be given to the isinglass, instead of gold or silver, by simple mixture.

COLD CREAM.—Lard (prepared), 2 pounds; suet, 1 pound. Melt, cool a little, and then stir in bergamotte, 2 drachms; essence of lemon, 1 drachm; neroli, 20 drops; rose water, 4 ounces.

SOFT SEALING WAX.—Bees'-wax, 11 parts; turpentine, 3 parts; olive oil, 1 part; shell lac, 5 parts. Mix with heat. Any colour may be given to this wax by mixing it with a sufficient quantity of any of the usual pigments employed in painting, previously reduced to fine powder.

ARTIFICIAL CORAL.—Yellow resin, 4 parts; vermilion, 1 part. Melt.

TO DISTIL CORDIALS OR COMPOUND SPIRITS.—The perfection of this grand branch of distillery depends upon the observation of the following general rules, which are easy to be observed and practised:—1. The artist must always be careful to use a well-cleansed spirit, or one freed from its own essential oil; for as a compound cordial is nothing more than a spirit impregnated with the essential oil of the ingredients, it is necessary that the spirit should have deposited its own. 2. Let the time of previous digestion be proportioned to the tenacity of the ingredients, or the ponderosity of their oil. 3. Let the strength of the fire be proportioned to the ponderosity of the oil intended to be raised with the spirit. 4. Let a due proportion of the finest parts of the essential oil be united with the spirit; the grosser and less fragrant parts of the oil not giving the spirit so agreeable a flavour, and at the same time rendering it thick and unsightly. This may in a great measure be effected by leaving out the feints, and making up to proof with fine soft water in their stead."

A careful observation of these four rules will render this extensive part of distillation far more perfect than it is at present. Nor will there be any occasion for the use of burnt alum, white of eggs, isinglass, &c., to fine down the cordial waters, for they will presently be fine, sweet, and pleasant.

SIR H. DAVY'S CORN SOLVENT.—Potash 2 parts; salt sorrel, 1 part. Mix in fine powder. Lay a small quantity on the corn for four or five successive nights, binding it on with rags.

COURT PLASTER.—Balsam of benzoin, 1 part; alcohol, 12 parts. Mix; then add isinglass, 2 parts; barley water to dissolve. Strain the two solutions separately, then mix them. For use, place the bottle in warm water, and give the silk, previously strained, ten or twelve coats with a brush; when dry, give it a coat of the following:—Chio turpentine, 1 part; tincture of benzoin, 2 parts. Mix.

DAWSON'S LOZENGES.—Powdered lump sugar, 26 parts; powdered gum arabic, 2 parts; Italian juice, 1 part; starch, 3 parts. Mix with warm water, and form into lozenges.

DONOVAN'S MERCURIAL OINTMENT.—Protoxide of mercury, 1 pound; purified lard, 16 pounds; suet, 4 pounds. Mix, and keep them in a heat of 325°, Fahr., for two hours, constantly stirring them. The lard and suet must be perfectly pure, as the presence of salt would decompose a part of the oxide, and produce a portion of protochloride of mercury or calomel. This preparation is more powerful than the strong mercurial ointment.

DRUGGISTS' COLOURS.—*Yellow.*—Iron filings, hydrochloric acid to dissolve. Dilute with water.

Red.—Solution of sal ammoniac, cochineal to colour.

Blue.—1. Sulphate of copper, 1 part; alum, 1 part; water, 16 parts; oil of vitriol, q. s. 2. Indigo, 1 part; oil of vitriol, 3 parts. Dissolve, then dilute with water. 3. Ferrocyanide of iron, 1 part; hydrochloric acid, 2 parts. Dissolve, then dilute with water.

Green.—1. Verdigris, dilute sulphuric acid to dissolve. Dilute with water. 2. Verdigris, 1 part; acetic acid, 3 parts. Dissolve, and dilute with water.

Purple.—1. Sugar of lead, 1 ounce; cochineal, 25 grains. Dissolve. 2. Infusion of logwood, water of ammonia, q. s. 3. Logwood, alum, water, q. s. Make a decoction, and add a little spirit.

THE BEBEERU-TREE OF BRITISH GUIANA.—The bark of this tree occurs in large flat pieces, one or two feet long, and varying in breadth from two to six inches. It is about four inches thick, of a cinnamon-brown colour, without aroma, pungency, or acrimony, but a strong persistent bitter taste, with considerable astringency. It contains two distinct alkaloids, one called bebeerine, the other sipecrine, and a crystallizable deliquescent organic acid, which appears to differ from all known vegetable acids, and to which Dr. Maclagan has given the name of bebeeric acid. Bebeerine in mass or powder is opaque; in thin layers, it is in the form of transparent, yellow, shining film. Its taste is strongly and permanently bitter, with a slightly resinous flavour, and it evolves feebly a corresponding odour, when united with sulphuric acid. It is soluble in five times its weight of absolute alcohol, and also in rectified and proof spirit and ether, but very sparingly so in water. It forms soluble unerystallizable salts with sulphuric, hydrochloric, and acetic acids, but nitric acid decomposes it, converting it into a substance somewhat analogous to carbazotic acid. Sipeerine is of a dark brown shining aspect. It forms unerystallizable neutral salts with acids. Pure bebeeric acid is white, and beautifully crystalline. It rapidly deliquesces; fuses at 300 deg., and at 400 deg. sublimes apparently unchanged. The sulphate of bebeerine has been tried at Demerara, with marked success, in the treatment of intermittent fever. Dr. Maclagan has likewise tried it in some cases of ague, and also in periodic head-ache, and the results obtained were such as to leave no doubt as to its anti-periodic powers. Dr. Maclaglan believes Dr. Warburg's fever drops to be a tincture of bebeer, probably from the seeds. His opinion is formed from chemical analysis. Dr. Pritchett, who tried these drops, in Africa, considers them to be a compound of *morphia and quinine*.

ANNUAIRE DE THERAPEUTIQUE

For 1844.

Translated from the French of Dr. A. Bouchardat, Assistant Professor at the Faculty of Medicine at Paris, Principal Pharmacien at the Hôtel-Dieu, &c.

[Continued from p. 7.]

Purgatives.—*Sulphate of Potass.*—This salt, even when perfectly pure, has been already shown not to be so innocuous as the sulphates of soda and magnesia. M. Bouchardat has already published cases in which injurious results have followed the exhibition of this salt; and experiments which he has since performed on the lower order of animals, have demonstrated the truth of this statement. The adulteration of this salt with corrosive sublimate, and the sulphates of copper, zinc, and iron, has been ascertained more recently. M. Lepage has pointed out the following very convenient mode of analysis:—The solution of the sulphate ought not to have any influence on litmus paper or the syrup of violets, and it ought not to give a precipitate either with ammonia, the sulphhydrate of ammonia, or gallic acid. No pharmacien should use this salt without having previously tested it, and medical men would act advisedly by substituting for it the sulphates of magnesia and soda, the innocuousness of which has been already demonstrated, and which can serve for all the therapeutic uses of the sulphate of potash.

Preparation of the Hyposulphite of Soda (Walchner).—500 grammes of the dry carbonate of soda and 150 grammes of sulphur are mixed together, and heated gradually in a glass or porcelain capsule, until the sulphur is melted. The heat being equally maintained, the mass, which is in a state of agglutination, is broken up, and turned about so that every part is brought in contact with the air. The salt is dissolved in water, and filtered, to separate it from the iron with which it is mixed, and the liquid afterwards boiled with flowers of sulphur; the almost colorless, filtered liquid, when much concentrated, will yield the hyposulphite of soda in very pure and beautiful crystals, and in large quantity. A too sudden elevation of the temperature readily burns a little of the sulphur; a portion of the carbonate of soda then remains unchanged, and modifies the purity of the hyposulphite in the first crystallization; but it is very easily separated.

Therapeutic Properties of the Hyposulphite of Soda (Dupasquier).—M. Dupasquier has published a work on the therapeutic properties of the hyposulphite of soda, based upon a great number of observations, from which he draws the following conclusions:—1st, the hyposulphite of soda is not at all poisonous, and may be given internally in the dose of from thirty to forty-five grammes without inconvenience; 2ndly, the hyposulphite of soda does not act otherwise than the sulphate of soda, and other neutral alkaline salts; it purges in the same doses, and produces analogous effects; 3rdly, the hyposulphite of soda, and consequently the alkaline hyposulphites in general, cannot be assimilated with the sulphurous or hepatic principles of the mineral waters, which act, notwithstanding the smallness of the dose, because they are violent poisons; they ought, on the contrary, to be classed among the saline and purgative principles; 4thly, the preparations which have the hyposulphite of soda for their basis ought not to be administered as medicines equivalent to the sulphurous mineral waters, of the therapeutic properties of which they have not any trace; these preparations, in fact, can only be regarded as similar in that respect to the artificial Seidlitz water and analogous saline and purgative compounds.

Magnesian Mixture.—M. Mialhe has given the following formula:—Eight grammes of magnesia, eighty grammes of syrup, and twenty grammes of orange-flower water. *** This formula is an useful one, when the medicine is to be taken immediately; but as it becomes solid in twenty-four hours, M. Gobley recommends the following in lieu thereof:—

Magnesian Draught (Gobley).—Ten grammes of calcined magnesia, thirty grammes of syrup of orange-flower, one hundred grammes of distilled water, mixed together. An agreeable purgative, to be taken in one or two doses.

Report on Gaseous Sea-water (Rayer).—The following extract is from a report made by M. Rayer to the Academy of Medicine on gaseous sea-water. The inhabitants of the sea coasts have for a long while employed sea water as a purgative drink under certain circumstances, while invalids, who have used sea water baths during the summer season as a means of cure, have also occasionally taken it internally, either as a purgative, or in a much smaller dose as a discutient. Many medical men, and Russell in particular, have recommended sea water as a drink in the treatment of a great number of diseases. Although a very careful examination of the observations and cases of this author may cause a desire for more positive and conclusive evidence, yet it cannot be denied that two important facts result from his experiments, namely, that sea water can be employed as a purgative, and that in some patients it has appeared to assist the resolution of chronic enlargements of the lymphatic ganglia. The difficulty of preserving sea water without change preventing its being advantageously transmitted over the continent, a great number of practitioners have not been able to study and appreciate the effects of the remedy themselves; its employment has consequently been restricted to certain localities, and most commonly during the hot and temperate seasons. Experiments with regard to its use even in these localities have not been numerous, on account of the unpleasant taste of the sea water. M. Pasquier, a pharmacien at Fécamp, to remedy these obstacles, proposes to free sea water from the vegetable or animal matters which prevent its preservation in closed vessels, by taking it up at sea, and filtering it, and to disguise its disagreeable savour by charging it with carbonic acid gas, and, consequently, to constitute it an ordinary medicine. The results of M. Rayer's experiments at la Charité are, that patients take the gaseous sea water without repugnance, and that the addition of carbonic acid really disguises the disagreeable taste it has when in a natural state. Many patients, it is true, after having found the first glassful pleasant enough, have complained of the salt taste of the fluid taken afterwards at longer or shorter intervals; but this manifestation of the salt and bitter taste of the water was caused in a great measure by neglect in not properly closing the bottle after the first glassful had been taken, and in not reversing it into a vessel half full of water, so as to prevent the escape of the carbonic acid. It is of the more importance to prevent this disengagement of the gas, because the thirst which generally follows the use of sea water as a purgative, and which is much complained of by those patients who neglect to take the precaution just alluded to, is generally very slight and fleeting after the use of sea water sufficiently charged with carbonic acid. M. Rayer has ascertained that gaseous sea water may be administered as a purgative in the cases in which the ordinary saline purgatives are prescribed. A bottle of gaseous sea water has a rather more purgative action than a bottle of artificial Seidlitz water at 32 gr. He adds that, by a comparative study of the action of gaseous sea water and of other purgatives, both in their evacuant effects and their more remote influence on the constitution, he has been led to think that sea water possesses particular advantages in individuals of a serofulous constitution; nevertheless, additional facts are in his opinion necessary to give a scientific value to this fact. In future, however, it will be easy to multiply experiments, and to vary them in a number of diseases in which the internal use of sea water has been recommended, either in purgative or alterative doses.

Sea Bathing (Nardo).—Sea water baths owe their properties to the salts and organic matters contained in them. M. Nardo adopts the following plan to increase their efficiency:—Sea weeds are collected, and allowed to macerate for several hours, exposed to the heat and light of the sun, until the liquid in which they are placed has acquired a sufficient degree of heat, and that marine odour which is so easy to recognise, and which indicates that the requisite degree of saturation has been obtained. M. Nardo has employed this water for years, both internally and externally, and he says that he has derived the greatest advantage from it in the treatment of scrofulous diseases.

Aloetic Ointment (Rognetta).—Sixty grammes of aloes, ninety grammes of petroleum, ninety grammes of oxgall, and one kilogramme of purified fat. These articles are to be mixed together at a gentle heat, the fat being added gradually. From thirty to sixty grammes are prescribed at a time, to be employed in frictions over the abdomen in children affected with inflammatory diarrhœa. It may also be employed as a vermifuge.

Purgative Elixir of Clary.—Twenty grammes of scammony, twenty grammes of jalap, five grammes of rhubarb, five grammes of calamus aromaticus, five grammes of juniper, twenty grammes of nitrate of potash, two hundred and fifty grammes of sugar, and one thousand grammes of alcohol at 80°. The dose of this elixir is one or two teaspoonsful. This formula is given to replace the *elixir anti-glaireux de Guillé.*

Antiphlogistics.—*Syncope employed as an Antiphlogistic* (Boudin).—In the *Annuaire* for 1843, the plan of bleeding adopted by M. Boudin was pointed out; it is again alluded to, because, if this therapeutic measure obtain the stamp of experience, it will prove an immense step in practice, by depriving blood-letting of its greatest inconvenience, by preventing the impoverishment of the blood, and the extreme debility of the patient. The new plan is no way intended to banish blood-letting, but merely to restrict its use. M. Boudin's plan consists in inducing refrigeration of the body, and the provocation of the cutaneous transpiration. These results often shew themselves independent of the quantity of blood drawn, and a bleeding to the amount of a kilogramme is often not followed by any depression, while, on the other hand, the state of weakness of the patient or the typhoid condition counter-indicate the employment of very large bleedings. It is in these circumstances especially that M. Boudin has recourse to the following plan:—The patient is placed upright, with his feet placed in a sinapised pediluvium; if he cannot support himself, an assistant must hold him up. After standing thus from five minutes to a quarter of an hour, a large opening is made in one or both arms at once. The patient very frequently has scarcely lost two ounces of blood before the wished for syncope, with refrigeration of the body and moisture of the skin, occurs. Immediately upon this the patient, who during this operation should have been carefully covered up, should be conveyed to bed, with the head as much raised as possible, in order to prolong the results which have been thus obtained, and which would be arrested by a too horizontal position.

The Treatment of Psoitis (Fouquier).—M. H. Morizot, a young physician, who has just died at the age of thirty-one years, published, in the *Journal de Medecine*, a memoir on psoitis, extracted from the clinical lectures of M. Fouquier. The passages from this important essay which relate to the treatment are as follows:—The treatment of psoitis at its commencement is entirely antiphlogistic. In some cases it may be of service to open a vein, but at all events local bleedings must be repeated in proportion to the intensity of the inflammation, and of the relief they afford. Emollient poultices and fomentations are always useful, and often salutary. Constipation should be prevented by every proper means. Diluent drinks and absolute diet complete the first part of the treatment. When pus appears under the integument of the iliac fossa, the tumour may be opened, or it may be allowed to burst spontaneously. This latter plan was very successful in the case of a patient treated by M. Fouquier; but in two other cases which he cured, M. Fouquier made a very narrow opening with a trocar, not allowing more than a small quantity of pus to be evacuated by the first puncture, so that the abscess was gradually emptied. This plan succeeded perfectly well. M. Fouquier prefers producing only a partial evacuation of the pus, in order to prevent the effects of the contact of the air with the abscess, which would happen with a large and deep opening. The incision was dressed with cerate spread on lint, and a poultice over that. The discharge

of the pus by the intestines does not give rise to any special indication. It is chiefly necessary to support the patient's strength, and to prevent, as soon as possible, the injurious effects of a progressive debility, kept up, on the one hand, by the long continuance of the disease, and, on the other, by the repeated occurrence of diarrhœa and night-sweats. It is important also not to permit the patient to quit his bed too soon, and walking ought not to be allowed for a long while after the suppuration has ceased.

Poudre Content.—Five hundred grammes of sugar, one thousand grammes of rice flour, seven hundred and fifty grammes of cacao, twenty-five grammes of cinnamon, ten grammes of cloves, five grammes of cardamoms, and five drops of black balsam of Peru. *** Used as an analeptic.

Quinine.—In accordance with the views entertained by most authors, M. Bouchardat used to class the cinchonas and their alkalies among the tonic medicines, an arrangement which, he says, may be correct, if we consider the action of the complicated product resulting from the union of tannin with the organic bases quinine or cinchonine, and when this natural combination is administered in small doses; but if we regard the preparations of quinine only, then the *ensemble* of their physiological properties ought to separate them from the agents which are classed as tonics; their action on the nervous system, on the blood, and on the circulatory apparatus, places them in a special intermediate class, perhaps between the class of alteratives and narcotics. If quinine acts on the nervous system with much less energy than morphia, it is more active than this narcotic base, if we consider its action on the entire organization; quinine, in fact, is more poisonous than morphia in the lower order of animals. M. Bouchardat purposes to resume this important subject in a work on the comparative action of poisons, which he read last year before the Academy of Sciences. He adds that he has also studied the optical properties of the salts of quinine and cinchonine. These two bases, when dissolved in inactive solvents, either free or combined, act with great power on polarized light; but whilst the rotary molecular power of quinine is exerted towards the left, that of cinchonine is exerted to the right. The power of quinine is increased, and that of cinchonine diminished, under the influence of acids. The two actions are then evidently equal, but they are exerted in inverse directions. The sulphate of quinine can not only be recognized by the apparatus of M. Biot, but its purity can also be ascertained with the greatest certainty. The solutions of quinine and its salts have an extremely unstable rotary molecular power; it changes with the temperature. This instability is, perhaps, one of the causes of the rapidity and energy of action of these compounds.

Resuming the subject of the new therapeutical applications of the sulphate of quinine in large doses, upon which so much was said in the *Annuaire* for last year, M. Bouchardat observes that the sulphate of quinine exhibited by M. Gueneau de Mussy at the Hotel Dieu in three or four doses, but in the quantity of one gramme, not of four grammes, as was previously the case, has been found very efficacious in the treatment of acute articular rheumatism.

The following is a *resumé* of an important essay by M. Monneret, a pupil of M. Andral:—

Large Doses of Sulphate of Quinine in the Treatment of Acute Articular Rheumatism (Monneret).—M. Monneret read a very important paper on this subject before the Academy of Medicine, from the details of which the following conclusions are drawn:—1st, The sulphate of quinine exerts a local action on the painful element of the disease designated by the name of articular rheumatism; 2ndly, This action is neither constant nor durable; 3rdly, the employment of sulphate of quinine does not prevent the complications which may occur with regard to the heart and its envelope; 4thly, the sulphate of quinine is not an antiphlogistic; 5thly, if it presents such appearances, it is only by the nervous disorder it occasions, and which may mask, but in a very fugacious manner, the phenomena of inflammation; 6thly, it produces a poisoning, attended by symptoms of three different kinds,—nervous phenomena, properly so called, disordering the general or special sensibility; a typhoid state; and gastro-intestinal inflammations.

Febrifuge gaseous Water (Meirieu).—Twelve grains of sulphate of quinine, four grammes of tartaric acid, five grammes of bicarbonate of soda, twenty grammes of powdered sugar; and six hundred and twenty-five grammes of water. *** To be taken in the dose of a half wineglassful, in fever from marsh miasmata.

Anti-Arthritic Pills (Lemazurier).—M. Bouchardat has received the following formula from M. Lemazurier, who has used it with success both on his patients and on himself, in cases of regular acute gout, which has proceeded as far as the second or third fit:—Ten grains of sulphate of quinine, five grains of the powdered leaves of the digitalis purpurea, two grains of powdered belladonna root, two grains of acetate of morphia, two grains of extract of the lactusa virosa, and a sufficient quantity of the *poudre temperante* of Stahl, to make twenty pills; the whole to be taken in two days by two at a time, if the attack be severe, or in the course of four days if the pain be less intense. M. Lemazurier says these pills appear to him to be really efficacious. The gouty pains are generally appeased, or at all events much diminished, in the space of four-and-twenty hours, dating from the first dose; nevertheless, the joint which has been attacked is not completely freed until after several days, and the swelling of the surrounding parts continues for some time afterwards. The sole phenomena that have been observed during the use of these pills are—1st, a very free secretion of urine, at first very clear, but assuming a deeper colour afterwards, and yielding a rose-coloured sediment; 2ndly, nausea, inappetence, and a little somnolency, but in some cases only; and, thirdly, a moderate degree of constipation. The exhibition of the pills has been sometimes preceded by local abstraction of blood in plethoric persons, and in cases of severe reaction. A mild regimen, white meats, vegetables, abstinence from coffee and spirituous drinks, and the habitual use of the bi-carbonate of soda in very small doses, have appeared to M. Lemazurier to assist the cure and prevent relapses.

Febrifuge of Metzinger.—Fifteen grammes of the cinchona calysaya, four grammes of the carbonate of potash, two grammes of the carbonate of ammonia, four grammes of vegetable salt, two grammes of the golden sulphuret of antimony, four grammes of the extract of water-trefoil, four grammes of extract of wormwood, and a sufficient quantity of extract of parsley, to make a pillular mass, to be divided into pills weighing three grains each. Six of these pills are taken immediately after the accession; six others three hours after the first dose; and a third dose of six pills three or four hours before the return of the fever. The fit once stopped, the patient will continue to take four pills evening and morning for three or four days, the dose being afterwards successively reduced to three and two pills.

Therapeutic Employment of Variolaria (A. de Barreau).—The variolaria (*variolaria discoidea*, Pers.), is an extremely bitter lichen. It has been recommended in intermittent fevers, intermittent neuralgia, and verminous diseases; it is prescribed in powder in the dose of twelve grains, in one or two doses in honey or in prunes. This indigenous remedy is worthy the attention of physicians and chemists; it must contain an immediate active principle, which can be readily separated, and is most probably analogous to the cetrarine, which is extracted from the lichen Islandicus.

Chalybeates.—The rules for the choice of ferruginous preparations are laid down in the *Annuaires* for 1841 and 1842, and hitherto there has not been any important alteration introduced. Practitioners give the preference to metallic iron, or to the salts of the protoxide, providing this protoxide is combined with either carbonic acid, or with an organic acid which can be readily assimilated. Either porphyrised iron, or iron reduced by hydrogen, or the lactate of the protoxide of iron, or preparations containing the proto-carbonate of iron, are commonly prescribed. Many hospital physicians daily order the bread of Dr. Drouet Boissiere, to which the proto-carbonate of iron has been added. It is a means of exhibiting ferruginous preparations as convenient as it is efficacious. Ferruginous preparations were almost altogether abandoned, but M. Trousseau has done much to bring them again into use, and they are at present in such request, that that skilful practitioner has deemed it requisite to point out the circumstances in which they are contra-indicated.

Contra-indication of Ferruginous Preparations (Trousseau).—M. Trousseau says, if a young girl at the age of puberty becomes chlorotic, the disease not being of long duration, and the patient not having had any scrofulous enlargements in her youth, nor hæmoptysis, and if her parents are not of the tuberculous diathesis, then iron may be given in large doses. But if there be reason to suspect a tuberculous predisposition, he recommends living in the country, especially in a better climate, the analeptic regimen, horse exercise, and sulphurous medicine, and abstains altogether from the use of iron. As a general rule, there will be less ground for suspicion as to the presence of tuberculous complication in chlorosis, the more youthful the patient is, and consequently ferruginous preparations are more indicated, and better supported, the nearer the woman is to the period of adolescence. If chlorosis attacks an adult woman, from 25 to 35 years of age, he advises caution in the use of chalybeates, because at that age chlorosis is altogether something abnormal. If the patient has ever spit blood, iron ought to be altogether prohibited, and it should also be omitted if, after it has been exhibited for a month or two, it has not caused a very great amelioration. On the other hand, it should be given if chlorosis has come on suddenly after large losses of blood, after metrorrhagia, or painful lactation, the remarks which have been previously made with respect to tuberculous predisposition being carefully considered.

Sulphate of Iron: its Use in the Treatment of Varus Mentagra and Gutta Rosea (Dauvergne).—In the *Annuaire* for 1813, Velpeau's application of a solution of sulphate of iron in erysipelas was described; M. Dauvergne now recommends the same remedy in mentagra. The following are the formulæ which he employs:—

First Solution.—Twenty-five parts of the sulphate of iron, two hundred parts of water.

Second Solution.—Fifty parts of sulphate of iron, two hundred parts of water. *** When the inflammation has ceased, the diseased parts are bathed in these solutions. The ulcerated parts are sometimes dusted with the *ferro-carbonaceous powder*, viz.: ten parts of sulphate of iron, and thirty-five parts of charcoal.

Astringents.—*Vaccinium Myrtillus: the extract of the berries in diarrhœa* (Reiss).—The juice of the berries of the vaccinium myrtillus were formerly much recommended in cases of diarrhœa, dysentery, hæmoptysis, catarrhal affections, and scurvy. M. Reiss has ascertained that it is efficacious in cases of diarrhœa. The following are the preparations he employs:—

Alcoholic Tincture of the Vaccinium Myrtillus.—One hundred grammes of the fresh berries of the vaccinium myrtillus, one quart of brandy, macerated together for a fortnight. Dose, a small liqueur-glassful.

Extract of Vaccinium Myrtillus.—A sufficient quantity of the juice of the berries of the vaccinium myrtillus, evaporated to the consistence of an extract and made into pills, weighing four grains each. From four to six are given daily.

Syrup of the Vaccinium Myrtillus.—Five grammes of the extract of the vaccinium myrtillus, dissolved in a very small quantity of water, after which a kilogramme of boiling syrup is added. *** Each spoonful of this syrup contains about ten grains of the extract; from two to six spoonsful are given daily. M. Bergasse has published a case of very severe chronic diarrhœa, which was cured by the internal exhibition of thirty grammes of the myrtle-berries administered in substance.

Ptisan of Polygonum Aviculare (Levrat).—Twenty grammes of polygonum aviculare, a quart of water, boiled together; after which one hundred grammes of syrup of gum are added. *** Used in chronic diarrhœa.

Collyrium of Tannin (Desmarres).—One hundred grammes of distilled water, one gramme of pure tannin, twenty grammes of distilled cherry-

laurel water; used as a collyrium in the second period of catarrhal conjunctivitis.

Collyrium of Rhatany (Desmarres).—One hundred grammes of distilled water, one gramme of pure tannin, twenty grammes of distilled cherry-laurel water, ten grains of extract of rhatany, twelve drops of Rousseau's laudanum. Make a solution, which is to be filtered, and used as a collyrium.

Collyrium of Rhatany.—Two grammes of rhatany root, boiled in a hundred and twenty grammes of plain water, filtered, and fifteen grammes of rose water, twelve drops of Rousseau's laudanum, and two grammes of gum mucilage added. *** These two collyria are employed in cases of ophthalmia complicated with photophobia, their use being preceded by appropriate antiphlogistic treatment.

Ointment against Ringworm (Cazenave).—One gramme of tannin, thirty grammes of lard, with a sufficient quantity of water to make an ointment, which is employed in inunction on the diseased patches. The parts are to be washed daily with an alkaline solution. M. Cazenave sometimes employs the following ointment:—Twenty grammes of citrine ointment, ten grammes of tar. *** Used in friction over the diseased places.

Ranque's Plaster.—Fifty grammes of conium plaster, and fifty grammes of gum diachylon plaster, softened at a gentle heat, and forty grammes of the powder of theriaca,* ten grammes of camphor, two grammes of powdered sulphur, incorporated with it, to an homogeneous plaster, which is to be spread over pieces of calico or skin large enough to cover the entire abdomen. M. Ranque regards this plaster as being of an incontestable utility in typhoid affections. He looks upon the two following appearances as diagnostic of these affections:—1st, a pearly-white exudation upon the gums between the molares; and, secondly, an indigo or mulberry colour of leech bites.

ALTERATIVES; SUBSTITUTIVES.—*Iodhydrargyrate of the Ioduret of Potassium.*—The combination of the binioduret of mercury with ioduret of potassium, discovered by M. P. Boullay, and first employed medicinally by M. Puche, constitutes, according to M. Bourchardat, the most certain mercurial agent, and the most easy to use. Multiplied experiments have proved to him that it holds the first rank, with regard to energy, among the mercurial compounds. M. Limousin Lamothe has published a work on this agent, from which the following is an extract. He commences by describing its preparation: a mixture is made with equal parts of the binioduret of mercury, and the ioduret of potassium, and a sufficient quantity of distilled water is added, to effect their solution. Evaporated with care, this solution gives needle-like crystals, of a yellow colour; if it is evaporated to dryness, a residue is obtained in the form of a greenish-yellow powder, attracting the moisture of the air. The following are some of the formulæ recommended by M. Limousin Lamothe:—

Solution.—Sixteen grains of the iodhydrargyrate of the ioduret of potassium, 500 grammes of distilled water. *** The dose of this solution is from eight to sixty grammes, taken gradually in the four and twenty hours:

Pills.—Sixteen grains of the iodhydrargyrate of the ioduret of potassium, one gramme and ten grains of lactine (sugar of milk) made into thirty-two pills. Dose, from one to eight daily, taken gradually:

Ointment.—Twenty grammes of the iodhydrargyrate of the ioduret of potassium, 300 grammes of lard. *** Cases sometimes occur where the proportion of the iodhyrargyrate is increased. This ointment, which in the first instance is white, at least if a solution of the salt has been used, always acquires at the end of a certain time a brownish-yellow colour:

Gargle.—One gramme of the iodhydrargyrate of the ioduret of potassium, 1000 grammes of distilled water. This solution may also be sometimes used as an injection into the nasal fossa.

The iodhydrargyrate of the ioduret of potassium is of the greatest service in the treatment of the tertiary symptoms of syphilis, and it is in that form of the disease that it is employed by M. Puche at the Venereal Hospital, at Paris. The following are the formulæ to which that distinguished practitioner gives the preference:—

Syrup of the Iodhydrargyrate of Potassium (Puche).—One gramme of the iodhydrargyrate of potassium, ten grammes of tincture of saffron, and 489 grammes of simple syrup. Dose from twenty-five to a hundred grammes daily in an appropriate menstruum, in inveterate cases of syphilitic disease. This syrup contains a grain of the iodhydrargyrate of potassium in every dose of twenty-five grammes.

Compound Anti-Syphilitic Syrup (Puche).—One gramme of the iodhydrargyrate of potassium, one gramme of iodine, twenty grammes of ioduret of potassium, and 478 grammes of syrup of red poppies. Dose, as the preceding, from twenty-five to a hundred grammes daily, in an appropriate menstruum. It is prescribed in cases of tertiary syphilitic affections, complicated with secondary symptoms, in persons of a lymphatic constitution. This syrup contains a grain of the iodhydrargyrate, a grain of iodine, and a gramme of the ioduret of potassium, in each dose of twenty-five grammes. It is a very energetic medicine, easy to dose, and, when used with skill, has had very fortunate results. *** With this syrup, and with the preceding, the patient should have a little vial, on which a circle of paper is placed, shewing exactly the measure of the daily dose prescribed by the physician.

The iodhydrargyrate of potassium may be prepared extemporaneously with the greatest facility, by triturating together equal parts of the binioduret of mercury, and the ioduret of potassium, together with a few drops of water or syrup; the beautiful red colour instantly disappears, and the salt becomes completely dissolved.

Normal Mercurial Liquor (Mialhe).—500 grammes of distilled water, one gramme of sea salt, one gramme of sal ammoniac, the white of one egg, six grains of corrosive sublimate—the white of egg is beaten up with distilled water, and filtered, and the three saline compounds are then dissolved in the albuminous water, which is afterwards again filtered. This liquor contains two-fifths of a grain of corrosive sublimate in every thirty grammes, or one-fifth of a grain in each spoonful.

The Proto-ioduret of Mercury (Mialhe).—M. Mialhe has ascertained that there exist in pharmacy two kinds or varieties of the proto-ioduret of mercury,—one, a greenish yellow, is a neutral proto-ioduret,—the other, a deeper green, is a basic proto-ioduret, containing about 8 per cent. of mercury in excess. This latter variety is that which is principally found in the market, and in chemists' shops. This iodurct, containing a less proportion of the binioduret than that which is prepared according to the directions in the codex, should certainly be preferred to it as a medicine, were it not possible to remove from the neutral proto-ioduret the binioduret which it contains, than which nothing can be more easily effected—all that is requisite is to wash it several times with hot alcohol, until it no longer yields a precipitate with sulphuretted hydrogen, to remove it altogether.

Hydrargyro-Ferruginous Pills (Collier).—Two grammes of mercury, one gramme of sesqui-oxide of iron, and three grammes of conserve of roses, made into twenty pills; from one to three to be taken daily in syphilitic affections, in chloro-anemic, or scrofulous persons.

Arabic Treatment (M. Payan).—M. Payan has made known, under the name "*Arabic Treatment,*" a certain plan of treatment for the tertiary symptoms of syphilis, which has been preserved by tradition at Marseilles. An opiate, pills, a sodorific drink, and a peculiar regimen called the dry diet, constitute this mode of medication.

Arabic Opiate.—150 grammes of powdered sarsaparilla, thirty grammes of powdered smilax china, thirty grammes of powdered hazel-nut shells, four cloves, and a sufficient quantity of honey to make an opiate (electuary?), the dose of which will be from four to five grains, evening and morning.

Arabic Pills.—thirty grammes of pure quicksilver, thirty grammes of the deuto-chlorurct of mercury, thirty grammes of powdered pyrethrum, sixty grammes of senna, and a sufficient quantity of honey to make a pilular mass, which is to be divided into four or six grain pills; two to be taken daily.

Sudorific Ptisan.—This is made with a decoction of smilax china, and of sarsaparilla. This should be the sole drink taken by the patient during the treatment, and he should drink a quart daily. The dry regimen consists in a total proscription of ordinary food, and in the use of cakes, nuts, roasted almonds, figs, and raisins. This diet is an indispensable accompaniment to the treatment. This eccentric plan is highly vaunted by M. Payan, in certain tertiary forms of syphilis.

Collyrium of the Cyanuret of Mercury (Desmarres).—100 grammes of distilled water, with one grain of cyanuret of mercury dissolved in it. Used as a collyrium in glandular blepharitis, in scrofulous subjects, after the long continued use of emollients.

Treatment of Ulcerated Keratitis, and of Senile Iritis (N. Guilliot).—These affections, which are common among old men, and produce blindness at an advanced period of life, are combatted by the following drops, which are instilled between the eyelids four times a-day:—One to six grains of the bichloruret of mercury, dissolved in thirty grammes of distilled water. The strength of the collyrium may vary between the indicated proportions, according to the circumstances of the case.

Lotion against Vegetations on the Penis (Boisseuil).—Ten grains of corrosive sublimate, ten grammes of Sydenham's laudanum, 500 grammes of distilled water. All that is required is to dip the penis into this lotion three or four times a day, when the tops of the vegetations will become blackened, dry up, and fall away in a state of atrophy. It is sometimes advantageous to use the lotion in a more or less concentrated form, and to precede or follow its use by emollient lotions. M. Boisseuil observes, that whenever vegetations are under treatment, whether of syphilitic origin or not, the most simple and efficacious plan consists in the use of this lotion of corrosive sublimate. If they accompany the primitive symptoms of venereal infection, or if from the history they are regarded as secondary signs, an appropriate general treatment must be had recourse to at the same time.

Alcoholic Mercurial Lotion (Baumés).—One gramme of corrosive sublimate, 150 grammes of distilled rose water, and two grammes of eau de Cologne; used in the treatment of gutta rosea, acne, and inveterate vesicular, and puro-vesicular eruptions.

Rational Liquid Proto-Nitrate of Mercury (Mialhe).—Thirty grammes of the basic proto-nitrate of mercury, twenty grammes of nitric acid, and one hundred grammes of distilled water. The mercurial nitrate is first to be bruised in a glass or porcelain mortar, then the acidulated distilled water added, after which it is again to be bruised, and when bottled the undissolved residue is to be kept with the liquid.

Escharotic Solution of Freyberg.—Two grammes of camphor, four grammes of bichloruret of mercury, thirty grammes of rectified alcohol. Employed to destroy condylomata and syphilitic vegetations.

Seyffer's Powders.—A grain of the binioduret of mercury dissolved in two drops of alcohol, eight grains of calomel, prepared by steam, added, and triturated together, and then ten grammes of sugar added, to make a very homogeneous powder, which is to be divided into thirty-two doses, one of which is to be given evening, morning, and noon, to a child from three to six years old, labouring under hydrencephalus.

On the Employment of Chloro-ioduret of Mercury, and on its Preparation.—The idea occurred to M. Recamier, to employ an ointment made by combining the ioduret and chlorurct of mercury, and he states that he has found it very serviceable in dispersing tumours of the breast. The following is his formula:—two grains of the chloro-ioduret of mercury, and ten grammes of lard, or cerate without water, mixed together very carefully. One or two frictions are made daily with one gramme of this ointment.

* A compound electuary somewhat resembling the celebrated mithridate.

M. Caventou prepares the chloro-ioduret of mercury in his laboratory, in the following manner:—equal parts of the binioduret, and of the bichloruret of mercury are employed; the bichloruret of mercury is dissolved in a sufficient quantity of alcohol at 40°, after which, the binioduret is added, and is partially dissolved in the alcohol by means of the bichloruret. The product is evaporated in a capsule, and a pulverulent residue of a red colour is obtained. What is the nature of this product? It is evidently very complicated. M. Bouchardat has dissolved in boiling alcohol the indicated proportions of bichloruret and binioduret of mercury, and he obtained on the cooling, and spontaneous evaporation of part of the alcohol, two distinct products: firstly, yellow crystals, resulting from the combination of the ioduret of mercury with the chloruret—and secondly, small microscopic crystals of the binioduret of mercury. It is evident, therefore, that the salt employed by M. Recamier is a mixture of the bichloro-ioduret of mercury, and of the binioduret of mercury. However, whatever its composition may be, this salt is one of the most energetic mercurial compounds; it is certainly more active than its two components taken separately.

Two definite combinations of the bichloro-ioduret of mercury are known; one, described by Polydore Boullay, is yellow, and contains 37·63 parts of chloruret, and 62·37 of ioduret, each containing the same quantity of mercury; the other, obtained by Liebig, is met with in the form of white dendritic crystals, in which the ioduret is combined with twice the quantity of chloruret contained in the yellow precipitate.

Hydrargyro-Belladonna Ointment (P. de Mignot).—In the preceding *Annuaires* has been published M. P. de Mignot's mode of treatment of accidental phymosis and paraphymosis by means of belladonna; many new facts have since fully shewn the efficacy of that plan. The following is the formula for an ointment to be used when intense syphilitic inflammation complicates the phymosis: forty grammes of strong mercurial ointment, five grammes of the hydro-alcoholic extract of belladonna, five grammes of liquid balsam of Peru. This ointment, M. de Mignot says, may also be of service in other cases of disease—for instance, by adding from one to two grammes of the gummy extract of opium, we have an excellent topical application for hæmorrhoidal tumours.

Hanay's Ointment.—Eight scruples of tartarised antimony, six grains of corrosive sublimate, forty-five grammes of lard, carefully mixed together. For external use.

Paste against Epididymitis (Desruelles).—120 grammes of linseed meal, 120 grammes of tormentilla powder, thirty grammes of mercurial ointment, four grammes of extract of belladonna, with a sufficient quantity of hemp oil, made into a paste, which is to be spread on a piece of cloth, with which the diseased testicle is enveloped. This application is to be renewed three or four times in the twenty-four hours, and a seat bath of black soap taken every morning. According to M. Desruelles, the pain is soothed almost immediately, the redness disappears, and the swelling diminishes. When there remains only an increase of size of the organ, it should be enclosed in diachylon plaster, which, remaining on the part for several days, keeps it in a sort of local bath, produced by the non-evaporation of the transpiration, and thus is caused the re-absorption of the effused fluids. M. Desruelles describes this as a very convenient plan; the testicle is kept suspended, and it rarely fails.

Baths against Mercurial Salivation (Baumgartner).—Ten grammes of nitric acid, ten grammes of hydrochloric acid, with a sufficient quantity of water. The bath apparatus must be made of wood.

Nitrate of Silver.—M. Boudin has furnished the following formulæ for the use of nitrate of silver:—

Pills.—Four grains of crystallised nitrate of silver, dissolved in a few drops of distilled water, the solution being saturated with a sufficient quantity of starch powder to make twelve pills, each of which consequently contains about a third of a grain. From three to nine of these are given in the course of a day in chronic gastritis, gastralgia, and epilepsy. These pills should be prepared fresh, as otherwise the nitrate will be decomposed.

Intestinal Injection.—One to three grains of nitrate of silver, dissolved in 150 grammes of distilled water; used in obstinate diarrhœa, attended with little sensibility of the large intestines. M. Boudin has shown by his publications in the *Gazette Medicale*, of Marseilles, that the solution of silver always acts, doubtlessly by imbibition, on an extent of surface beyond that to which it is applied. The facts which have been cited are certain, and thence may be deduced the important fact that with the intestinal injection in question we may exert an influence even beyond the ileo-cœcal valvè, and modify ulceration of the lower part of the small intestines, which, both in phthisis and in typhoid fever, often complicates atonic diarrhœa.

Vesical Injection.—Four grains of crystallized nitrate of silver dissolved in 500 grammes of distilled water. This solution, the strength of which may be gradually increased, is employed in the treatment of chronic catarrh of the bladder. The degree of sensibility of that viscus having been ascertained by the first injection, subsequent ones will be regulated accordingly.

Ointment.—Two grains of the nitrate of silver, four grammes of lard. Used, first in the treatment of ulcerative conjunctivitis—and, secondly, in leucorrhea; several vaginal injections having been previously made, a piece of lint spread with the ointment is placed and retained in the vagina.

Use of the Chloruret of Silver (Perri).—According to M. Perri, three grains of the chloruret of silver, given four or five times a day in cases of epilepsy produced effects similar to those of the nitrate, but more marked. In chronic dysentery half a grain to three grains given three times a day, produce an immediate diminution in the number of stools, and an amelioration of the other symptoms. The menstrual discharge, even when it has been suspended for years, has reappeared under the influence of this medicine, administered for two or three weeks together. M. Perri has also employed it with success in the treatment of the secondary symptoms of syphilis.

Pills of the Ioduret of Silver (Patterson).—Four grains of the ioduret of silver, made into twenty pills, with a sufficient quantity of rose confection; one pill to be taken daily in cases of gastralgia. The ioduret of silver is a white, yellowish, insoluble, heavy powder, and is obtained by the double decomposition of the ioduret of potassium, and the nitrate of silver. In this form silver does not possess the annoying property of discolouring the skin; the ioduret of silver may, therefore, be substituted for the nitrate in the treatment of epilepsy. Dr. Patterson states further, but his remark is unsupported by direct observation, that the ioduret of potassium, administered internally, may be useful in removing the oxide of silver from the skin. M. Serres, of Montpellier, and M. Salvani employ the ioduret of silver in the same doses in the treatment of the tertiary symptoms of syphilis.

The use of Nitrate of Silver in Ophthalmia (Velpeau).—In the preceding numbers of the *Annuaire*, the utility of the nitrate of silver in ophthalmia has been shewn; the following are the rules laid down by M. Velpeau for its use:—first, nitrate of silver is the best topical application that can be employed in a great number of acute and chronic diseases of the eye; secondly, it should be employed in the form of ointment in the different forms of blepharitis; thirdly, most advantage is derived from its application in the solid form in inflammation of the eyelids; fourthly, in conjunctivitis it is most serviceable as a collyrium; fifthly, in slight conjunctivitis a solution of one to three grains of the nitrate in thirty grammes of water will generally be sufficient; sixthly, the employment of a stick of the nitrate may also be useful, but it is rather dangerous; and, 7thly, it is always advantageous in the treatment of ophthalmia, to diminish and augment, alternately, the quantity of the nitrate of silver used.

Treatment of Urethral Blenorrhagia (Ricord).—When there are not any symptoms of inflammation present, the stoppage of the blenorrhagia should be attempted, and, among the various measures recommended for that purpose, the most efficacious appear to be injections with the nitrate of silver.

Argentine Injection.—Ten grains of nitrate of silver, thirty grammes of distilled water. This injection should be used with a glass syringe; the fluid should pass through the entire extent of the canal, and remain in it half a minute. It is sometimes necessary to increase the dose of the nitrate, and to raise it as high as a drachm. One injection daily is sufficient. Cubebs and copaiba are prescribed at the same time. When the discharge is but little more than mere moisture, M. Ricord directs the use of the following injection:—

Injection of Acetate of Zinc.—A gramme of acetate of lead, a gramme of sulphate of zinc, two hundred grammes of water. To be used as an injection three times a-day. When the blenorrhagia is accompanied by acute symptoms, an energetic antiphlogistic treatment must be first had recourse to. In the treatment of gleet, M. Ricord employs an injection containing two grains of proto-ioduret of iron in a hundred grammes of water, or else the following injection:—

Astringent Injection.—One hundred and fifty grammes of red wine of the South, fifty grammes of distilled rose-water, one gramme of extract of rhatany, two grammes of Sydenham's laudanum. To be used as an injection three or four times a-day.

Employment of the Nitrate of Silver in Cauterizing the Granulations of the Cervix Uteri (Chomel).—After having given a trial to the acid nitrate of mercury, M. Chomel has decided upon giving the preference to the nitrate of silver. This agent cauterizes best the little projections or granulations which constitute the principal element of the disease, and its action is more under control, while that of the acid nitrate of mercury, on account of its liquid state, cannot be so readily limited, and may be exercised on the depressed healthy parts as well as on the projecting diseased portions. From fifteen to twenty cauterizations with the nitrate of silver, requiring about six weeks or two months' treatment, are generally sufficient to effect a cure. There are certain precautions to be taken after each cauterization; these consist in introducing, as far as the neck of the womb, a roll of dry cotton, by which the part may be wiped, so that there may not remain any pieces of caustic, which, remaining there, might cauterize the parts too deeply. There is no fear of repeating the application of caustic too frequently; it should only be abandoned when the red borders which limit the granulations have become of as pale a tint as the neighbouring parts. When this effect has been produced, we should yet wait a fortnight longer, to see if it continues, for sometimes the morbid redness reappears at the end of a longer or shorter period, and it is consequently only at the end of that time that the cure can be considered real and permanent.

Ointment of the Nitrate of Silver (Jobert).—Ten grammes of nitrate of silver, forty grammes of lard. M. Jobert employs this ointment, which he first of all recommended in the treatment of white swelling, as a topical application in erysipelas. He has ascertained that these caustic preparations possess the property of diminishing the painful and insupportable tension of the parts affected with erysipelas, and also of limiting the extension of the disease.

Anti-Epileptic Powders (De Losen).—One grain of the ammoniaco-sulphate of copper, five grammes of powdered white sugar, mixed together, and divided into six doses, one to be taken three times a day, and a small glass of old Malaga wine after each dose. This is to be continued for several days, and then the dose of the salt of copper is to be increased by dividing the foregoing quantity into four packets only. The ammoniaco-sulphate of copper has long been recommended; Biett used to prescribe it in such cases, and J. P. Frank employed it before him, but M. Bouchardat is of opinion that the formula for its exhibition contained in the second volume, p. 510, of the new edition of his works, published by Bailliere, is erroneous. The dose of the salt of copper is much too large.

The numerous arsenal of drugs employed to com-

bat any disease may generally be regarded as a proof of the insufficiency of our art in remedying it; in this respect epilepsy may occupy the first rank; each year brings forth a crowd of specifics for the disease, and yet the epileptics remained uncured as before. The past year has not been more unfruitful than the preceding. The following, however, has the authority of a well known name, and also of seme success :—

Anti-Epileptic Powders (Chabrely).—No. 1. 150 grammes of powder of Guttetus, fifty grammes of powdered valerian, mixed together, and divided into packets containing one or two grammes. No. 2. Fifty grammes of powder of Carignan, fifty grammes of powdered valerian, divided into packets containing from one to two grammes. M. Chabrely administers these medicines in the following manner:—He gives evening and morning a spoonful of syrup of valerian in a cupful of infusion of orange leaves; *the day before the new moon* he makes the patient take a gramme of Carignan and Guttetus's powder, with the valerian, in a cupful of sweetened infusion of linden, and the same dose in the evening, and twice a-day for the two following days. He does the same thing at the *advent of the full moon*, that is, the powders are given the day before, the day of the full moon, and the day after. Twelve packets of the Carignan powder are taken in the course of the month, and on other days the patient merely takes the syrup of valerian. This plan is persevered in, without any change, for four or six months, after which the anti-periodic powders are omitted, and the syrup of valerian only used.

M. Chabrely observes that some medical men will be astonished, not to use a stronger word, that he pays such attention to the phases of the moon in the administration of his anti-epileptic mixture. They will perhaps think, says he, that I wish to revive judicial astrology. God forbid! But he asks of attentive practitioners if they have not noticed a striking coincidence between the convulsions of children, for instance, and the phases of the full and new moon. All physicians believe this in secret, he says, but none dare acknowledge it openly.

Arsenical Preparations.—*Oxide and Cyanuret of Cacodyle* (Bunsen).—The oxide of cacodyle was first designated by the same of *alcarzine;* it is obtained by the distillation of *Cadet's liquor* under a layer of non-aerated water. Cadet's liquor is procured by distilling arsenious acid with the alkaline acetates. The oxide of cacodyle is a compound remarkable for its chemical properties, by the numerous series of compounds which it can produce, and for the energy of its toxic properties. The most remarkable of the compounds which it furnishes is certainly the *cyanuret of cacodyle.* This substance, which possesses extraordinary toxic energy, is remarkable for its tendency to crystallization. It is obtained by treating a concentrated solution of the cyanuret of mercury with the oxide of cacodyle. The cyanuret of cacodyle melts at 91°, Fahr., into an ethereal, colourless liquid; at 90° it becomes a crystalline mass, of an adamantine brilliancy; it boils at 316°, Fahr. This substance is certainly the most poisonous that is known; a few centigrammes (fifths of a grain) diffused through the air of a room at the ordinary temperature, in the state of vapour, are quite sufficient to produce numbness of the hands and feet, vertigo, and tinnitus aurium. These symptoms may be followed by syncope, but they will not be of long duration, if their cause be immediately avoided.

Use of Fowler's Solution in Squamous Diseases (Devergie).—M. Devergie has exhibited Fowler's solution to about three hundred patients without their experiencing any unpleasant consequences; he has often found it very serviceable in squamous diseases. He says that formerly Fowler's solution used to be given in the dose of two drops, increased every eight or ten days by two drops more, so that the patient only took twelve or fourteen drops at the end of several months' treatment, and he was subjected to this plan of medication for ten, fifteen, or eighteen months. M. Devergie begins with two drops of the solution, which he directs to be taken diluted in a simple julep in the morning, fasting. The dose is increased by two drops every four days, and he never exceeds fourteen drops. He says that physicians have given thirty and forty drops in the course of the day, but this assertion does not appear to be correct. M. Biett and the other physicians must have been deceived by their patients. M. Devergie has never exceeded the dose of sixteen drops without the occurrence of symptoms which have compelled him to cease its administration. Each dose is given to the patient by the sister of the ward *(la religieuse)*, and it is then taken by him in her presence, and in this way M. Devergie has been led to regard as unfounded the assertions that have been made contrary to the results he has obtained. In three weeks the patients have reached the highest dose he gives, and at that dose they continue, until the following external signs have become manifest:—The first phenomenon which occurs is a stationary state of the epidermic secretion, then a diminution in the thickness of the skin, and consequently a shrinking of the elevations. A little later the diseased parts change colour; from red they become brown, and from brown to a blackish brown. The shrinking of the elevations increases in proportion to the change of colour; finally, when that is at the maximum, the skin has become sound, soft, supple, and secreting as in the normal state.

Arsenical Solution (Devergie). — Fowler's arsenical solution is, as every one knows, so energetic a preparation, that it can only be prescribed by drops, so that the slightest error in the dosing such a medicine might be attended with very serious consequences. M. Devergie, a physician at the Hospital St. Louis, to avoid this risk, proposes the following formula as a substitute for Fowler's solution, by using which the most fractional doses of the arsenite of potash may be prescribed by grammes:—Two grains of arsenious acid, two grains of carbonate of potash, 500 grammes of distilled water, ten grains of the compound spirit of balm, together with a sufficient quantity of tincture of cochineal to give it a deep colour. Each gramme of this solution contains about 1-5,000th or 2-10,000ths of a gramme of arsenious acid, whilst in Fowler's solution there is a fifth of a grain in each gramme. The observations of M. Devergie have been approved by the council of hospitals, by which the use of the new preparation has been ordered. The author recommends it to be coloured a deep rose tint, in order that, by its colour alone, its presence may be recognized in a mixture.

Paludal Miasma.—In the *Annuaires* for 1842 and 1843 were published the observations of Dr. Boudin, according to which tubercular phthisis and typhoid fever are of diminished frequency in marshy districts. This opinion has been brought forward again this year, with numerous facts, by that physician, in a work entitled *Essai de Geographic Medicale*, to which M. Bouchardat refers those who desire further information on the subject. The Royal Academy of Medicine having had the question brought before it by M. Rayer, M. Boudin's opinion has been corroborated by the result of numerous researches. Thus Dr. Chassinat, who is connected with the establishment of the minister of the interior, has published a statistical document on the mortality of the criminals at the three *bagnes* of France. From this document it appears that phthisis pulmonalis has numerous victims at Toulon, and that the deaths by the same disease are nine times more numerous at Brest than at Rochefort, the latter being so marshy as to have become a proverb. M. Boudin has communicated to the Institute a letter from Dr. Nepple, and another from Dr. Pacoud, shewing the utter absence of phthisis in the centre of the marshy district of la Bresse, and also the increasing frequency of the disease as they recede from the marshy centre. M. Hahn has sent a memoir to the Academy of Medicine, in which he states that the number of phthisical cases and cases of typhoid fever has diminished in the 69th regiment of the line, in proportion to the length of residence of that regiment in the marshes called the Citadel of Strasburgh. The following is the ratio of these diseases according to M. Hahn:—In 1841, marsh fever 146, phthisis 12, typhoid fever 73; in 1842, marsh fever 255, phthisis 8, typhoid fever 32; in 1843, marsh fever 244, phthisis and typhoid fever 6. After quitting Strasburgh, where this regiment went in 1840, the 69th was sent to Courbevoie, to reside in the same barracks with the 23rd Light Infantry. Such was the modification of the men's constitutions by the marsh miasma, that the 69th was sending men to the hospital with intermittent fevers, whilst the 23rd had no other diseases than affections of the chest and typhoid fevers. Since the arrival of the 69th regiment of the line at Courbevoie, that is, from the end of April, 1843, to the 1st of November, 12 deaths occurred in the 23rd, and only 3 in the 69th, 8 of them by typhoid fever in the 23rd, and only 1 by the same cause in the 69th.

These are facts which can be easily verified, and the importance of which no one can contest. The objections that have been offered against the doctrine of *morbid antagonism* are based on a false principle; besides, no one sought to prove the absolute absence of phthisis in marshy districts; the only point which it is sought to prove is the *relative rarity.* Dr. Lamothe writes thus on this subject to M. Bonchardat:—He (Dr. Lamothe) has been physician to the hospital of Dax in the Landes for forty-two years, and during that period has seen a very large number of cases. The hospital is both a civil and military institution. M. Lamothe has observed that all the phthisical patients are strangers to the neighbourhood, or else the phthisis was the consequence of a severe attack of pneumonia, or produced by traumatic causes. He is not acquainted with any family in the town or environs affected with constitutional phthisis, that is, between the ages of eighteen and thirty or thirty-five years. The town of Dax and the neighbouring villages are exposed to the influence of malaria. Dr. Lamothe considers that these facts confirm the opinion of Dr. Boudin, and may tend to change or modify the therapeutics of phthisis, &c. On the other hand, M. Genest, in a lengthy essay, has sought to refute the opinion of Dr. Boudin, supporting his views on the documents published by the English government, which shew that phthisis exercises as extensive ravages in marshy stations as in other countries, but M. Bouchardat denies an absoluble value to these documents, inasmuch as they consist of observations made upon soldiers of different races, who had suddenly changed their climate—a cause of itself sufficiently powerful to induce phthisis.

Arsenical Solution (Dr. Boudin).—Two grains of arsenious acid, one quart of distilled water. Twenty grammes of this solution, the dosing of which it is much more easy to regulate than Fowler's drops, contain about 1-25th of a grain; five grammes are equal to one hundredth of a grain. M. Boudin is in the habit of commencing the treatment of intermittent fevers by the administration of forty grammes of this solution, equal to 2-25ths of a grain of arsenious acid. The solution should be given as near as possible to from four or five hours before the expected attack. It is advisable to precede this medication by an emetic, one gramme of ipecacuanha, and two grains of tartarized antimony. As soon as the fever is cut short, the dose may be progressively diminished to twenty grammes, and, finally, to five grammes of the solution. In inveterate syphilis, but especially in the syphilides, and long continued dartrous eruptions, the dose to begin with may be forty grammes, increased by ten or twenty daily, until the patient takes one, two, or even three centigrammes at a dose;* instead, however, of giving so large a quantity at once, it would be better to give it in divided doses. As the solution has neither taste nor smell, patients take it without repugnance. M. Boudin prefers it to the powder which he used to employ; its exhibition, however, requires strict control. M. Boudin employs very minute precautions, and he has, consequently, been able to employ arsenic in his practice at the hospitals of Marseilles and Versailles, for three years, without experiencing any inconvenience.

Quinino-Arsenical Mixture (Boudin).—Twelve

* M. Bouchardat must mean by this statement that the dose of the solution may be thus raised until the patient takes one, two, or even three centigrammes or fifths of a grain of arsenious acid. The passage is not very clearly expressed.

grains of sulphate of quinine, thirty grammes of distilled water, two drops of sulphuric acid, to which is to be added sixty grammes of the preceding solution. This contains about 1-8th of a grain of arsenious acid, and is to be taken at one dose about five hours before the expected attack. This remedy is employed in those exceptional cases in which the intermittent is found intractable both to sulphate of quinine and arsenic given separately.

Cupro Arsenious Injection (Desruelles).—Eight grammes of Lanfranc's collyrium, four grammes of cinchona wine, two grammes of aromatic wine, two grammes of wine of opium, and 120 grammes of rose water. This is used as an injection twice or thrice in the twenty-four hours. After the second or third day, four grammes of the collyrium may be added to the prescription, the quantity of rose water being diminished by thirty grammes. This injection, M. Desruelles says, is of service in erythemoid uteritis, but it is inefficacious in dermoid uteritis.

ON THE SULPHITES.

BY DR. JAMES SHERIDAN MUSPRATT, OF LIVERPOOL.

[For the Medical Times.]

(Continued from p. 9.)

SULPHITE OF STRONTIA.

This compound deposits, as a white tasteless powder, when sulphite of potash or soda is added to a soluble salt of strontia. It is obtained in crystalline grains by dissolving this precipitated mass in water charged with sulphurous acid, or by conducting a stream of the gas through water diffused with the carbonate of strontia. When the salt was dried over sulphuric acid, and heated in a tube, it gave no aqueous vapour, but evolved some sulphurous acid and sulphur. Its composition, according to previous analysis, is represented by the annexed formula: Sto . SO_2, corresponding with the carbonate Sto . CO_2. It is very slowly converted into sulphate on exposure to the air.

SULPHITE OF LIME.

The precipitate which I obtained by adding sulphite of soda to chloride of calcium was readily dissolved by suspending it in water, and conducting a stream of sulphurous acid gas through the liquid. The menstruum was placed over sulphuric acid for three days, during which time well-formed, six-sided, prismatical crystals were obtained. These crystals possessed a slightly sulphureous and rather styptic taste, and when exposed to the air for a long time, acquired a fine silky efflorescence of sulphate of lime upon their surface. On submitting them to a strong heat water was first given off, and ultimately decomposition ensued, sulphurous acid and sulphur being expelled. The residuum consisted principally of sulphate of lime; traces of sulphuret of calcium were also present. I only determined the water in this salt, as will be seen from the annexed analysis:—

2·114 grm. salt ignited with chromate of lead gave:
·488 grm. water.

Composition in per Cents.

		Theory.	Found.
Sulphurous acid	401·17	40·86	——
Lime	356·02	36·25	——
Water	225·00	22·89	23·09
	982·19	100·00	

Formula: Ca O . SO_2 + 2 HO

The sulphites of barytes, strontia, and lime are soluble (as will be perceived from the preceding statement) in sulphurous acid, probably forming acid salts, and, what is somewhat singular, and shows an analogy between the two gases, is, that the corresponding carbonates are dissolved in a similar manner by carbonic acid. If in these instances bi-salts are not produced, the aqueous solutions of the above-named acids serve as specific solvents.

SULPHITES OF MAGNESIA.

I passed a stream of sulphurous acid gas through the carbonate of magnesia diffused in water; during the transmission the menstruum increased slightly in temperature, and assumed a yellowish green tinge. After some time an amorphous powder deposited, which I collected and redissolved in an excess of the acid, and then allowed the solution to evaporate over sulphuric acid. In two days, white, transparent, oblique, rhombic prisms were obtained, which possessed an earthy and disagreeable bitterish taste. This salt, on exposure to the air, becomes opaline, owing to the ready formation of sulphate. When heated, it tumefies, disengaging water, sulphurous acid, and a small portion of sulphur and magnesia, with a quantity of sulphate of magnesia, composes the residuum. This decomposition may be represented by the subjoined equation:—

4 (Mg O . SO_2) resolved into SO_2 . S + 2 Mg O + 2 (Mg O . SO_3)

The following is the analysis of the salt dried quickly between the folds of bibulous paper:—

1·448 grm. salt treated with fuming nitric acid and nitrate of barytes, gave:
2·031 grm. sulphate of barytes; and
2·630 grm. salt gave:
2·000 grm. sulphate of magnesia = ·680 magnesia.

I did not determine the water in this salt, as the above shows.

Composition in per Cents.

		Theory.	Found.
1 eq. sulphurous acid	401·17	40·25	39·22
1 eq. magnesia	258·35	25·90	25·86
3 eq. water (or loss)	337·5	33.85	34·92
	997·02	100·00	100·00

From the above numerical results, the subsequent formula is deduced, to which I annex a corresponding carbonate.

Mg O . SO_2 + 3 HO
Mg O . CO_2 + 3 HO

The sulphite of magnesia, obtained and analyzed by Fourcroy and Vauquelin, agrees with the formula Mg O . SO_2 + 4 HO.

There is a double salt of sulphite of magnesia and ammonia, which likewise corresponds to a similarly constituted carbonate. This ammonio-magnesian sulphite I have not analyzed, intending at some future period to investigate the numerous interesting double compounds that sulphurous acid is capable of affording, with different bases, in order to ascertain whether the relationship holds in that class of salts as well as in those to which my attention has latterly been directed.

Although the sulphite of magnesia is soluble in sulphurous acid, still this must not be held as a proof of the existence of an acid salt; for Professor Graham, whose researches upon these compounds are so much prized, remarks that "on theoretical grounds, supersalts of magnesia, or the magnesian family of oxides, of the ordinary constitution, are not to be expected, as they would be double salts of water and another magnesian oxide."

SULPHITE OF ALUMINA.

I diffused in water hydrated alumina, which had been precipitated from the sulphate of alumina and potash by carbonate of ammonia, and well washed for a week with boiling and also distilled water (in order to free it entirely from any adhering sulphates), and then passed through the liquid a stream of sulphurous acid gas; the whole of the earth readily dissolved, and when the menstruum was heated on a water bath, it deposited a white, argillaceous-looking powder, which I found to be the earth in combination with sulphurous acid. The sulphite of alumina must be immediately separated from the liquid, or otherwise it is redissolved as the solution cools. I did not wait until the precipitate dried over sulphuric acid, but reanalysed a sulphite of alumina, which M. Gongginsperg had prepared and investigated in the Giessen Laboratory about eight or ten months since. It was a perfectly white, farinaceous-looking powder, and possessed a somewhat sulphureous taste. When heated for a very long time in a crucible, it parted with the whole of its acid, and the earth remained behind in a pure state.

Analysis of this Salt, with the Sulphurous Acid taken as Loss.

1·463 grm. salt, when heated strongly, gave:
·603 grm. alumina; and
·777 grm. salt, ignited with chromate of lead, gave:
·253 grm. water.

The following is the above reduced to per cents., with the mean of M. Gongginsperg's analyses* (he did not determine the water). My results differ very slightly from his, although the salt had been so long prepared; and therefore the conclusions arrived at *prove* the existence of a sulphite of alumina, although M. P. Berthier remarks that "alumina dissolves in sulphurous acid in the state of a humid hydrate, but it is afterwards completely precipitated from the liquid by heat, and the deposit is a hydrate and not a subsulphite."

Composition in per Cents.

		Gonggins-perg.	Found.	Theory.
1 eq. sulphurous acid	401·17	27·295	26·245	26·86
1 eq. alumina	171·17	43·100	41·220	43·01
4 eq. water	450·00	29·605	32·535	30·13
	1022·34	100·000	100·000	100·00

Formula, $Al_2 O_3$. SO_2 + 4 HO

SULPHITE OF GLUCINA.

Glucina dissolves readily in sulphurous acid, but does not precipitate when the solution is heated. (*Berthier—Ann. Chem. et Phys.*, 50, 371.)

SULPHITE OF YTTRIA.

It is dissolved by digesting hydrated yttria in aqueous sulphuric acid, or by precipitating a salt of yttria with an alkaline sulphite. A white powder insoluble in water, but partially dissolved by sulphurous acid. The solution, when evaporated in the air, gives crystals of sulphate of yttria.—*Beslin*.

SULPHITE OF CERIUM.

This salt is procured by dissolving the carbonate of the protoxide in a solution of sulphurous acid. It crystallizes in light coloured amethystine needles.—*Klafroth*.

SULPHITE OF ZIRCONIA.

White, insoluble in water; it is sparingly dissolved by aqueous sulphurous acid, and deposits on boiling the solution.—*Berthier*.

SULPHITES OF IRON.

When sulphurous acid is passed through water, diffused with freshly precipitated carbonate of the protoxide of iron, the whole readily dissolves, and the liquid assumes a light brown colour. This solution is readily decomposed on exposure to the air, owing to a higher state of oxidation ensuing; but when absolute alcohol is added to the sulphited liquid, so soon as the whole of the protoxide has dissolved, a yellowish, amorphous powder is deposited, which parts with its acid with as much facility as the carbonate, and nearly pure peroxide of iron remains. (I have previously mentioned the sulphite of iron obtained by Fordos and Gélis by dissolving the metal in the acid). I found that calcined peroxide of iron was very tardily dissolved by sulphurous acid. No perceptible action takes place at first; but if the peroxide be kept in contact with an aqueous solution of this gas for some days, the whole disappears, forming a colourless solution (hydrated peroxide of iron dissolves readily in sulphurous acid), which contains equal proportions of sulphate and sulphite of iron. This decomposition may be represented by the subjoined equation:—

2 ($Fe_2 O_3$) + 4 SO_2 resolved into 2 (Fe O . SO_2) + 2 (Fe O . SO_3)

When this liquid is heated, so as to expel the uncombined acid, and then left to the atmospheric action for some days, the liquid acquires a light brownish colour, and there is deposited a reddish brown compound, containing sulphurous acid and peroxide of iron. Dr. Koene, of Brussels, obtained

* *Annalen der Chemie and Phamacie*, p. 132.

a salt, deposited in a similar manner to the above, which he expresses by the following formula :—

$$Fe\ O_3\ .\ SO_2 + 7\ HO.$$

This part of the subject alone is worth a complete investigation, as the reddish precipitate gives with the alkaline sulphites double salts, the properties and composition of which appear to be of a very singular and complex nature. Should these salts not be reinvestigated, I shall treat more fully of them in a future paper.

SULPHITE OF MANGANESE.

I obtained this salt in granular crystals, by conducting a stream of sulphurous acid gas through the carbonate; boiling and allowing the solution to repose for some days in a corked flask.

It is procured also (as a white amorphous powder) by digesting the carbonate in a strong solution of the gas. This salt is tasteless at first, but if kept in the mouth for some time, it leaves a very disagreeable metallic impression upon the tongue. It is insoluble in water, alcohol, and ether, but is readily dissolved by acids with elimination of sulphurous acid gas; very persistent in air, and, even when heated upon a water bath, gives off aqueous vapour without any appreciable decomposition ensuing. The above salt has previously been analysed by Dr. John, whose results will appear in the subsequent per cents. :—

I.

1·435 grm. salt treated with nitric acid, gave :
1·894 grm. sulphate of barytes.

II.

1·510 grm. salt treated with nitric acid, &c., gave :
2·002 grm. sulphate of barytes; and
1·093 grm. salt ignited with chromate of lead, gave :
·235 grm. water.

The manganese I have calculated as loss.

Composition in per Cents.

		Theory.	John.	Found. I.	Found. II.
1 eq. sulphurous acid	401·17	37·42	59 80	35·30	35·47
1 eq. protox. mangan.	445·90	20·99		——	21·50
1 eq. water	225·00	41·59	40 20	——	42·03
	1072·07	100·00	100·00	——	100·00

Dr. Thomson, of Glasgow, analysed a carbonate of manganese, which is analogous to the above sulphite. I subjoin the two formulæ :—

$$Mn\ O\ .\ SO_2 + 2\ HO.$$
$$Mn\ O\ .\ CO_2 + 2\ HO.$$

The carbonate appears in many respects similarly constituted to the sulphite, for it loses water at 100 C., without suffering decomposition. When the sulphite or manganese is strongly heated in an open crucible, sulphurous acid is liberated, and the residuum, which is dark brown, principally consists of deutoxide of manganese.

SULPHITES OF NICKEL.

I transmitted a stream of sulphurous acid through water, holding in suspension a large quantity of hydrated oxide of nickel, and obtained, after the whole had dissolved, a small quantity of a light greenish crystalline salt, which was not sensibly soluble in water, but dissolved with great readiness in hydrochloric acid, eliminating sulphurous acid.

Analyses of this Salt.

·625 grm. salt precipitated by caustic potash, gave :
·221 grm. oxide of nickel; and
·600 grm. salt ignited with chromate of lead, gave :
·206 grm. water.

The subjoined is the above reduced to per cents. with the sulphurous acid calculated as loss.

		Theory.	Found.
1 eq. oxide of nickel	469·68	35·57	35·52
4 eq. water . . .	450·00	34·06	34·33
1 eq. sulphurous acid	401·17	30·37	30·15
	1320·85	100·00	100·00

$$Formula—Ni\ O.\ SO_2 + 4\ HO.$$

The filtrate from the above-mentioned salt was placed over sulphuric acid for some days, during which time very fine tetrahedral crystals were deposited, which gave the following, when burnt with chromate of lead :—

1·0435 grm. salt gave :
·4600 grm. water = 44·08 p. c.—Theory 43·68

The reason why I did not determine the sulphurous acid and nickel in this salt, was on account of the water agreeing with the formula given by Fordos and Gelis for their sulphite, which has been previously mentioned. When only a small portion of this salt is heated in a crucible, a very bulky vesicular mass is obtained, containing, principally, oxide of nickel.

SULPHITES OF COBALT.

Carbonate of cobalt dissolves with the greatest facility in sulphurous acid, and the liquid obtained gives, when treated with alcohol, a beautiful flocculent pink precipitate, which is a sulphite probably containing one atom of water, analogous to the carbonate, which is a light pinkish powder, insoluble in water, and produced when the nitrate is treated with carbonate of soda.

I passed a stream of sulphurous acid gas through the oxide of cobalt, suspended in water, then boiled the resulting clear liquid, and allowed it to evaporate spontaneously in a closed flask; a pinkish granular salt deposited, which afforded the annexed results :—

1·082 grm. salt, treated with fuming nitric acid, &c., gave :
1·080 grm. sulphate of barytes; and
·737 grm. salt, ignited with chromate of lead, gave :
·303 grm. water.

The above represented in per cents., with the oxide of cobalt calculated as loss :—

		Theory.	Found.
1 eq. sulphurous acid	401·17	28·03	27·91
5 eq. water . . .	562·50	39·26	41.11
1 eq. oxide of cobalt	468·99	32·71	30·98
	1432·66	100·00	100·00

$$Formula—Co\ O\ .\ SO_2 + 5\ HO$$

SULPHITE OF ZINC.

The carbonate or oxide of zinc dissolves copiously in sulphurous acid, with a slight evolution of heat, and affords, on evaporation, prismatic crystals, possessing a disagreeable styptic taste. This salt is precipitated from its aqueous solution by either alcohol or ether, and the crystals thrown down by these precipitants are needle shaped. The sulphite of zinc is readily converted into sulphate on exposure to the air, and when submitted to heat in a porcelain crucible, water, sulphurous acid, and some sulphur are expelled, and the residuum is principally composed of sulphate, sulphuret, and oxide of zinc. The following is the analysis of this salt, dried repeatedly between folds of bibulous paper :—

1·344 grm. salt boiled with carbonate of potash, &c., gave :
·613 grm. oxide of zinc; and
17·50 grm. salt, treated with nitric acid, &c., gave :
2·220 grm. sulphate of zinc.

The above results are expressed in the subjoined per cents., with the water calculated as loss :—

		Theory.	Found.
1 eq. sulphurous acid	401·17	35·52	35·25
1 eq. oxide of zinc .	503 23	44·56	45·61
2 eq. water	225·00	19·92	19·14
	1129·40	100·00	100·00

Those numbers agree with the formula $Zn\ O\ .\ SO_2 + 2\ HO$, which corresponds with the one given by Fordos and Gélis.

It would be rather difficult to obtain a corresponding carbonate of zinc, for when the salts of this oxide are precipitated by a warm solution of an alkaline carbonate, the neutral carbonate subsides, in combination with hydrated oxide, as in the annexed formula.

$$2\ (Zn\ O\ .\ CO_2) + 3\ (Zn\ O\ .\ HO)$$

A neutral carbonate of zinc has, however, been obtained by *Smithson*, containing three atoms of water.

[To be continued.]

PALE AMBER VARNISH.—Pale amber, 6 parts. Fuse, then add hot boiled oil (pale), 20 parts. Boil until stringy, cool, and add spirits of turpentine, 35 parts. Mix well together.

IMPROVEMENT IN THE DAGUERREOTYPE PROCESS.

By M. DAGUERRE.

[Communicated to the French Academy, April 22, 1844, by M. ARAGO.]

You have been kind enough to announce to the Academy my having succeeded in recognizing, from a series of experiments, that in the then state of my process the sensitive film was certainly too thin; it could not furnish all the gradation of tints necessary to copy nature in relief and firmly; indeed, although the specimens heretofore obtained have not been wanting in purity, they leave, with few exceptions, much to be desired in respect to general effect and body.*

By superposing on the plate many metals, by reducing them into dust by rubbing, and by acidulating the empty spaces left by their molecules, I have succeeded in developing galvanic actions, which permit the employment of a much thicker film of iodine, without having to fear the influence of the free iodine during the operation of the light in the dark chamber.

The new combination which I employ, and which is composed of many metallic iodides, has the advantage of giving a sensitive film that is susceptible simultaneously of every value of tone; and thus I obtain, in a very short space of time, the representation of objects brilliantly illuminated, having half tints, which all preserve, as in nature, their transparency, and their relative effects.

By adding gold to the metals which I first used, I succeeded in removing the great difficulty presented by bromine, when used as an accelerating substance. We know that none but very experienced persons are able to employ bromine successfully, and that they do not succeed in obtaining the maximum sensibility except by chance; because it is impossible to determine this point very precisely, and immediately beyond it the bromine attacks the silver, and opposes the formation of the image.†

With my new method, the film of iodine is always saturated with bromine, since the plate may be left exposed to the vapour of this substance at least half the necessary time without inconvenience; for the application of the film of gold opposes the formation of what is termed the bromine veil. We must not, however, abuse this facility, for should the film of gold be too thin, it might be attacked, especially if it has been much worn by polishing.‡ The process which I am about to describe may perhaps be found a little complicated; but, notwithstanding the desire I had to simplify it as much as possible, I have, on the contrary, been led, by the results of my experiments, to multiply the substances employed, all of which play an important part in the process as a whole. I regard them as being all necessary to obtain a complete result, and this must be the case, because it is only gradually that I arrived at the discovery of the properties of these different metals, one of which assists the quickness, another the vigour of the impression, &c.§

From the association of these substances, there arises a power which neutralizes all the

* On the plate, cleaned as I have directed, by means of the bed of water, proofs of great fineness are rapidly obtained; but they, at the same time, want body, on account of the thinness of the sensitive film.

† Every one knows that the dry vapour of bromine is more favourable than that obtained by means of the bromine water; for the latter has the inconvenience of drawing with it moisture, which condenses on the surface of the plate. The employment of oil, which I point out further on, neutralizes this effect, and gives the vapour of bromine, though diluted with water, the same property as that of dry bromine.

‡ This is so true, that if an experiment is made on a plate which has been fixed several times, it may be left exposed to the vapour of bromine as many times the necessary period as it has received different gold films.

§ I would merely say, that the employment of all the metals mentioned further on is necessary, but the manner of applying them may vary.

unknown effects which so often occur to oppose the formation of the image.*

I think, moreover, that science and art ought not to be arrested by manipulation of greater or less length; we ought to think ourselves fortunate in obtaining beautiful results at this price, especially when the means of execution are easy. For the galvanic preparation of the plate does not present any difficulties. The operation is divided into two principal parts; the former, which is the longer, may be done some time in advance, and may be considered as the completion of the fabrication of the plate. This operation, when once done, serves indefinitely, and without doing it over again, a great number of experiments may be tried on the same plate.

Designation of the New Substances.

Aqueous solution of bichloride of mercury (corrosive sublimate).

Solution of cyanide of mercury.

White oil of petroleum, acidulated with nitric acid.

Solution of chloride of gold and platina.

Preparation of the Substances.

Aqueous Solution of Bichloride of Mercury. (Corrosive Sublimate).—Five decigrammes ($\frac{1}{2}$ gramme) of bichloride of mercury in 500 grammes of distilled water.

Solution of Cyanide of Mercury.—A flask of distilled water is saturated with cyanide of mercury, and any quantity is decanted off, and diluted with an equal quantity of distilled water.

White Acidulated Oil of Petroleum.†—This oil is acidulated by mixing with it one-tenth of pure nitric acid, which is left at least forty-eight hours, taking care occasionally to agitate the flask. The acidulated oil, which is decanted, powerfully reddens litmus paper. It is also a little coloured, although it remains very limpid.

Solution of Chloride of Gold and Platinum.—Not to multiply solutions, I set out with the common chloride of gold, which is used to fix the impressions. Its composition is well known:—1 gramme ($15\frac{1}{2}$ grs.) of chloride of gold, and 4 grammes of hypo-sulphite of soda, to 1 litre ($1\frac{3}{4}$ pints) of distilled water. With regard to the chloride of platinum, $2\frac{1}{2}$ décigrammes ($3\frac{3}{4}$ grs.) must be dissolved in 3 litres of distilled water; the two solutions are then mixed in equal quantities.

Manner of Operating.—First Preparation of the Plate.

In order to condense the description which is to follow, I shall mention each substance by abbreviation;—thus, to designate the *aqueous solution of bichloride of mercury*, I shall say, sublimate; for the *solution of cyanide of mercury*, cyanide; for *acidulated oil of petroleum*, oil; for *solution of gold and platinum*, gold and platinum; for *oxide of iron*, simply rouge.

The plate is first of all polished with sublimate and tripoli, and then with rouge,‡ until a beautiful black is obtained. The plate is then placed on the horizontal plane, and the cyanide solution, heated by a lamp, is poured on, precisely as if a picture were being fixed with chloride of gold. The mercury is deposited, and forms a whitish film. The plate is allowed to cool a little, and after having poured away the liquid, it is dried, by rubbing it with cotton and by powdering with rouge.

We have now to polish the whitish film deposited by the mercury. With a cotton wad, covered with oil and rouge, this film is rubbed just until it becomes of a beautiful black. In finishing, it may be rubbed pretty strongly, but with cotton only, to make the acidulated film as thin as possible.

The plate is then placed on the horizontal plane, and the solution of gold and platinum is poured on. It is heated as usual; it is then allowed to cool, and the liquid is poured off, in order that it may be dried, by being rubbed gently with cotton and rouge.

This operation must be carefully done, especially when the proof is not to be taken immediately; for otherwise lines of liquid would be left on the plate, which it is always difficult to remove. By this last rubbing the plate should be only dried, not polished.

The first preparation of the plate, which may be done a long time in advance, is here finished.

Second Preparation.

I think it is better to allow a greater interval than ten hours to intervene between this operation and the iodizing of the plate.

We have left the plate with its deposit of gold and platina. To polish this metallic film a wad of cotton must be taken, with oil and rouge, and the plate must be rubbed until it becomes black, and then, with alcohol and cotton alone, the film of oil and rouge is removed as thoroughly as possible.

We then rub more strongly, passing cotton, impregnated with cyanide, several times over the same spots. As this film dries very quickly, traces of inequality may be left on the plate; to avoid this, the cyanide must be again passed over, and while the plate is still moist, with a wad moistened with a little oil, the whole surface of the plate is to be quickly rubbed over, and the two substances are thus to be mixed; then with a wad of dry cotton the plate is rubbed, in order to give an united surface, and at the same time to dry the plate, taking care to remove from the cotton wad the parts which become moistened with the cyanide and the oil. Lastly, as the cotton still leaves some traces, the plate is powdered uniformly with a little rouge, which is allowed to fall and be rubbed lightly, and in a circular direction.

Then with a wad, impregnated with oil only, the plate is uniformly rubbed, so as to restore the burnish of the metal; it is then powdered with rouge and rubbed very lightly round, so as to brush off all the rouge, which draws with it the superabundance of the acidulated film.*

Finally, with a rather close cotton wad it is rubbed strongly, to give the last polish.†

It is not necessary to renew frequently the wads moistened with oil and rouge; we must only take care to keep them from dust.

I have said above that the first preparation of the plate may serve indefinitely; but it must be understood that the second should be modified, according as we are operating on a plate which has, or on one which has not, received a fixed impression.

On the Fixed Impression.

The spots which are left by the washing water must be removed with red oxide and water feebly acidulated with nitric acid (to two degrees in this season, and less in summer).

The plate must then be polished with oil and rouge, in order to remove all traces of the image to be effaced.

The operation, as I described it just above, for the second preparation of the new plate is continued, beginning from the employment of alcohol.

On the Impression not Fixed (but the Sensitive Film of which has been removed in the usual way in Hyposulphate of Soda.)

The plate must first be rubbed with alcohol and rouge, in order to remove the traces of the oil, which sever in making the preceding impression. We then continue in the same way that is mentioned above for the new plate, setting out with the employment of alcohol.

TABLE RESUMÉ OF THE OPERATIONS.

First Preparation.

1st. Corrosive sublimate with tripoli first, and rouge afterwards to polish the plate.

2nd. Hot cyanide of mercury, and dried with cotton and rouge.

3rd. Acidulated oil with rouge, to polish the mercury film.

4th. Gold and platinum, and dried with cotton and rouge.

Second Preparation.

5th. Acidulated oil, with rouge, to polish the film of gold and platinum.

6th. Absolute alcohol, to remove as much as possible the oil and the rouge.

7th. Cyanide of mercury, employed cold, and rubbed with cotton alone.

8th. Oil rubbed rather strongly, and finally equalized with powdered rouge.

On the Fixed Impression.

1st. Nitric acid at two degrees, with rouge to remove the spots.

2nd. Oil with rouge, to remove the traces of the image, and to polish.

Then continue as above, beginning with No. 6, alcohol, &c.

On the Impression not Fixed (the Sensitive Film of which has been removed with Hyposulphate of Soda).

Alcohol with rouge, to take away the traces of oil, and continue as above, beginning with No. 6, alcohol, &c.

Observations on Iodizing.

The colour of the picture depends on the tint which is given to the metallic iodide. It may, therefore, be varied at pleasure; however, the violet rose appears to me to be the most suitable.

To transmit the iodine to the plate, the sheet of pasteboard may be replaced by a plate of earthenware with the glazing worn off. The iodine transmitted by this means is not decomposed.

It is useless, I might even say hurtful, to heat the plate before passing it to the vapour of iodine.

On Washing with Hyposulphate of Soda.

To remove the sensitive film, the solution of hyposulphate of soda must not be too strong, because it then reduces the energy; sixty grammes of hyposulphate are enough for one litre of distilled water.—*Polytechnic Magazine.*

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* For by multiplying these elements, as in a pile, we augment this power, and thus we succeed, at the same time, in rendering active the most sluggish radiations, such as red and green.

† The most suitable oil of petroleum is of a greenish colour, and under different angles it gives azure reflections. I have preferred this among the fixed oils, because, although strongly acidulated, it always remains limpid. The object I have in view, in employing an acidulated oil, is to reduce the metals to powder, and to retain this powder on the surface of the plate, and at the same time to give greater thickness to the film by its unctuous properties; for the naphtha which results from the distillation of this oil does not produce the same effect, because, being too fluid, it draws away the dust of the metals. For the same reasons, I have lately recommended the employment of essence of lavender, rather than that of essence of turpentine.

‡ If I prefer rouge to other substances for polishing, it is not because I recognise in it any photogenic property, but because it burnishes better, and aids in fixing the film of gold, which is no longer liable to be removed in scales when it is too highly heated. The galvanic plates, when free from clouds and black spots (which sometimes occur in the original), receive the application of metals better than others; and consequently, as the chloride of gold adheres to them more strongly, it does not scale off.

* Care must be taken to press as little as possible, for otherwise the rouge would adhere to the plate, and form a general veil.

† When a plate is operated on which has received the first preparation a long time previously, before employing the acidulated oil and the red oxide, we must operate in the manner I indicate hereafter for the plate which has received a fixed impression. This precaution is necessary, in order to destroy the spots which time may have developed.

TINCTURA VANILLÆ FORTIOR.—Vanilla cut into small pieces, one ounce. Digest first with rectified spirit, six ounces, and afterwards with highly rectified spirit, six ounces. Mix the tinctures. Experience has proved that vanilla cannot be exhausted by one digestion.—*Pharm. Journ.*

ENERGIATYPE, A NEW PHOTOGRAPHIC PROCESS.

By Robert Hunt.

While pursuing some investigations, with a view to determine the influence of the solar rays upon precipitation, I have been led to the discovery of a new photographic agent, which can be employed in the preparation of paper with a facility which no other sensitive process possesses. Being desirous of affording all the information I possibly can to those who are anxious to avail themselves of the advantages offered by photography, I solicit a little space in your columns for the purpose of publishing the particulars of this new process. All the photographic processes with which we are at present acquainted, sufficiently sensitive for the fixation of the images of the camera-obscura, require the most careful and precise manipulation; consequently, those who are not accustomed to the niceties of experimental pursuits, are frequently annoyed by failures. The following statement will at once show the exceeding simplicity of the new discovery:—

Good letter-paper is first washed over with the following solution:—

A saturated solution of succinic acid, 2 drachms.
Mucilage of gum-arabic . . . . . ½ „
Water . . . . . 1½ „

When the paper is dry, it is washed over once with an argentine solution, consisting of 1 drachm of nitrate of silver to 1 ounce of distilled water. The paper is allowed to dry in the dark, and it is fit for use. It can be preserved in a portfolio, and at any time employed in the camera. This paper is a pure white, and it retains its colour, which is a great advantage. At present I find it necessary to expose this prepared paper in the camera-obscura for periods, varying with the quantity of sunshine, from two to eight minutes, although, from some results which I have obtained, I am satisfied that, by a nice adjustment of the proportions of the materials, a much shorter exposure will suffice. When the paper is removed from the camera, no trace of a picture is visible. We have then to mix together 1 drachm of a saturated solution of *sulphate of iron*, and 2 or 3 drachms of the *mucilage of gum-arabic*. A wide flat brush, saturated with this solution, is now swept over the face of the paper rapidly and evenly. In a few seconds the dormant images are seen to develope themselves, and with great rapidity a pleasing *negative* photographic picture is produced. The iron solution is to be washed off as soon as the best effect appears, this being done with a soft sponge and clean water. The drawing is then soaked for a short time in water, and may be permanently fixed by being washed over with ammonia, or, perhaps, better with a solution of the hyposulphite of soda, care being taken that the salt is afterwards well washed out of the paper. From the pictures thus produced, any number of others, correct in position, and in light and shadow, may be produced, by using the same succinated papers in the ordinary way, from five to ten minutes in sunshine producing the desired effect.

The advantages which this process possesses over every other must be, I think, apparent. The papers are prepared in the most simple manner, and may be kept ready by the tourist until required for use. They require no preparation previously to their being placed in the camera, and they can be preserved until a convenient opportunity offers for bringing out the picture, which is done in the most simple manner, with a material which can be any where procured.

Anxious to give the public the advantage of this process during the beautiful weather of the present season, I have not waited to perfect the manipulatory details which are necessary for the production of portraits. It is sufficient, however, to say, that experiment has satisfied me of its applicability for this purpose.

Prismatic examination has proved that the rays effecting this chemical change are those which I have elsewhere shown to be perfectly independent of solar light or heat. I, therefore, propose to distinguish this process by a name which has a general rather than a particular application. Regarding all photographic phenomena as due to the principle *Energia*, I would, nevertheless, wish to distinguish this very interesting process as the *Energiatype*.

I inclose you a few specimens of the results already obtained. The exceeding sensibility of the Energiatype is best shown by an attempt to copy engravings or leaves by it. The three specimens I inclose were produced by an exposure of considerably less than one second.—*Athenæum*.

REPORT ON A MEMOIR BY M. E. MARCHAND, ON THE ALTERATIONS OF THE ORGANIC ALKALIS, IN CONTACT WITH, AND UNDER THE INFLUENCE OF, OXYGEN IN THE NASCENT STATE.

By MM. Boullay and Bouchardat.

M. E. Marchand sent to the *Societè de Pharmacie* a memoir, the fruit of numerous observations on the action of oxygen in the nascent state on several organic bases.

In all the experiments which form the subject of his memoir, M. Marchand always had recourse to the peroxide of lead under the influence of water acidulated with sulphuric acid, in order to promote the reactions, and the organic alkalis on which he operated were cinchonine, quinine, strychnia, brucia, morphia, and narcotin.

The study undertaken by M. Marchand presents serious difficulties. Several chemists had previously attempted it. Pelletier was especially preoccupied with it in his own memoir on the action of iodine on the vegetable alkalis. Indeed, iodine, in reacting on the vegetable alkalis, furnishes, not as Pelletier stated, iodides of the vegetable alkalis, but iodides of hydriodates. By causing potassa to react on these bodies, an equivalent of iodine displaces an equivalent of oxygen from the potassa, and this oxygen goes to the organic base to oxidize it. Unfortunately the reaction is not so clear as theory seems to indicate. It is not an oxide of a vegetable alkali that is obtained, but a mixture of the vegetable alkali itself with several products of oxidation, which hitherto have not been isolated in the pure state and perfectly studied. Has M. Marchand been more fortunate? We fear not; for all the products which he obtained do not crystallize, have not accurately defined solubilities, do not fuse at fixed temperatures, and, in a word, do not present any of the characters of pure principles. Be this as it may, the extract which we give from M. Marchand's work proves that it contains interesting facts.

By the oxidation of cinchonine, M. Marchand obtained a colouring matter, which was presented under the form of an amorphous mass of a very deep violet colour. The author gives to the product a peculiar name (cinchonetin), which seems to us premature.

Under the same oxidizing influence, quinine gives two distinct products.

1st. A substance of a blood-red colour, of a bitter taste, soluble in water, in alcohol, and in ether; it dissolves without alteration, and retains its colour in sulphuric and nitric acids.

2nd. A substance insoluble in water, soluble, on the contrary, in alcohol and ether. When it is obtained by the spontaneous evaporation of its alcoholic solution, it is presented in the crystalline state, and its crystallization is analogous to that of hematin. Its solutions in alcohol and ether are violet. It furnishes a red solution with dilute sulphuric acid.

M. E. Marchand obtained as an ultimate product of the oxidizing action, a mixture containing an acid which he has not characterized.

Strychnia in solution in water, acidulated with sulphuric acid, submitted to the oxidizing influence of peroxide of lead, furnished by the cooling of the filtered liquors, a powder of a dirty yellow colour, insoluble or very sparingly soluble in cold water, soluble in a large quantity of boiling water, and soluble by heat in water acidulated with sulphuric acid, but precipitating on cooling; insoluble in ether, extremely sparingly soluble in alcohol. The best solvent of this powder is the solution of caustic potassa, which it seems to neutralize.

It is to be regretted that the author has not made a more profound study of this interesting product.

Brucia, submitted to oxidation under the influence of peroxide of lead, gave a solution which, evaporated, furnishes a matter of a fine red colour, partially soluble in boiling alcohol at 90°.

When morphia is submitted to the same reaction as the foregoing bases, it furnishes a reddish yellow liquid, which, by evaporation, gives a matter, very soluble in distilled water. The solution reddens litmus, and is very sparingly soluble in alcohol.

The products resulting from the oxidation of narcotin are of two orders:—1st, a brown colouring matter, very sparingly soluble in ether, very soluble, on the contrary, in water and alcohol; 2nd, opianic acid, studied by Liebig and Wöhler.

If, now, we consider, in a general manner, the results of the influence of oxygen in the nascent state on the vegetable alkalis, we must admit three distinct phases in these reactions.

First Degree of Oxidation.—The alkaline character of the organic bases is not destroyed; they are converted into new and more highly oxidized alkalis. This assertion, first made by M. Pelletier, then by M. Dumas, has been the subject of a great number of experiments performed by one of us.

Second Degree of Oxidation.—It is then that those different colouring matters are obtained which M. E. Marchand has especially studied.

Third Degree of Oxidation.—The oxidizing action being exhausted, we obtain acid matters—for example, opianic acid.

If the results hitherto remarked do not present all the desirable clearness, it is doubtless owing to the difficulty which experimentalists have experienced in separating the products of these complicated reactions.—*Journal de Pharmacie.*

OBSERVATIONS ON THE INTERNAL HEAT OF THE EARTH.

(From the Polytechnic Magazine,)

The old hypothesis, that there exists within this globe a vast mass of incandescent fluid matter, the shell of which constitutes the habitable part of the earth, has of late years been again revived, and with claims to our attention which it never before possessed. New facts have been brought to light by that indefatigable spirit of inquiry which has gone abroad in every department of science, and as these have a tendency towards the resuscitation of the doctrine of the internal heat, it becomes interesting to investigate their bearings on that doctrine.

Before entering upon the subject, we may premise that it should be laid down as a rule in its discussion, that no fact or argument be brought forward in support of the theory, merely because it is a theory; but the matter should be taken up in a fair spirit of inquiry, placing the theory in juxta-position with the facts, so as to show the relation they bear to each other; we may thus, by a just and legitimate deduction, form our opinion as to whether the theory be a probable one, or whether, for want of sufficient facts, we should still keep it in abeyance.

Such is the manner in which all theories should be treated, in order that they may become, as it were, the cement by which the temple of human knowledge is held together, instead of being, as they have too often proved, fragile superstructures raised upon foundations of sand.

The doctrine of the Central Heat is very ancient, and more or less connected with the traditions of almost all nations. It is difficult to trace this belief to any other source than to those very facts which at present are adduced in support of its reality; to which, perhaps, we may add some great and terrible primeval convulsion, which left its traces deeply fixed on the succeeding generation of mankind.

When the modern theories of the formation and structure of the earth were broached, we find that the traditionary doctrine became allied to philosophical speculation, and occupied a very

prominent part in many schemes of world-building that have long since been forgotten, and the doctrine itself has been almost laid aside as altogether inapplicable to the purposes of geological inquiry. Very lately, however, it has been again revived, and many facts have been discovered which appear to bear upon it. These we shall now shortly lay before our readers, and proceed to examine what the state of this earth's surface ought to be, were the theory correct, and how far it may be serviceable in explaining certain geological phenomena which are at present involved in mystery.

The facts on which the speculation rests are these:—1st. The existence of volcanoes; 2nd. Earthquakes; 3rd. The structure of mountain rocks of the igneous formation; 4th. Hot springs; and 5th. The temperature of mines, which increases in proportion to their depth, and the temperature of water, which also increases in the relation to the depth of the strata from which it flows; and lastly, the figure of the earth.

I.—THE EXISTENCE OF VOLCANOES.

All the theories of volcanic phenomena which connect these with chemical action appear nugatory, because there are only a certain number of chemical effects which evolve heat; and as we know what these are, and that they always give character to the products of the action, we have no right to infer their presence unless we find their accompanying characters in the products. Thus, we know that the union of sulphur with iron is attended with a considerable extrication of heat, and if there were a union of such enormous quantities of these substances in the earth as would be necessary to melt and force up to the surface such great torrents of fluid lava as we sometimes see pouring out of volcanic craters, we might naturally expect a large portion of sulphuret of iron in the lava. This, however, is not the case; and as this is by far the most likely combination with which we are acquainted, capable of producing the effect, the chemical theory must remain at present where it is, for want of facts in support of it.

We must then resort to some other mode of explanation. If we examine a terrestrial globe, we shall find that volcanoes are scattered over its whole surface. We find them among the snows of the Arctic regions, and in the opposite point of the globe amongst the islands of the Pacific; in the south of Europe; in Central Asia, South America, the West Indies, and over the whole Eastern Archipelago. In Africa, also, there are many appearances of modern volcanic action, which would, no doubt, be increased in number, if our knowledge of the countries it contains were more extensive. Now, it is argued that this universal spread of volcanic activity over the surface of our globe is much more likely to arise from one common cause, than from the operation of a number of detached causes. And, besides, we find a remarkable connection in that action amongst different volcanoes. It is rare that more than one crater is active in the same district. But if there be several craters, as in the volcanic regions of the Mediterranean, in the neighbourhood of each other, the one is quiescent while the other is in a state of eruption. All these facts seem to indicate the existence of a common central cause. It is, however, only just to state, that the whole aggregate effect of volcanoes, when compared with the supposed vast magnitude of the central fire, sinks into perfect insignificance.

This, again, may be taken as an argument in favour of trivial local causes. We shall not, however, give the explanation of this circumstance until we consider the uses of volcanic action. Such, then, is the general argument from volcanoes.

II.—EARTHQUAKES.

These stupendous phenomena of nature are very frequent in volcanic districts, and have a most evident connection with those subterranean causes, whatever they may be, from which volcanoes originate.

This connection is, indeed, so very close, that it is impossible not to refer them both to the same class of causes. But even in countries not subject to volcanic action we find earthquakes sometimes prevailing to some extent, and in such localities it is evident that other causes must be sought for beyond the mere proximity to volcanoes. When, for instance, we find the earth's surface, over a tract of many leagues in length and breadth, shaken by one impulse of subterranean force, we are irresistibly led to the conclusion that there is a cause in operation, the sphere of whose activity is not limited to one solitary point, but is exerted over a great part of the tract of the earthquake.

The sound which sometimes precedes and accompanies earthquakes is very peculiar, and is itself an argument for the existence of a great body of heated matter deep in the bowels of the earth. Its character varies at different times, but sometimes it is exactly like the sound produced by the pouring of water on red hot iron—the sound, in fact, of the rapid formation of a large quantity of steam. We once heard the sound produced by an earthquake; it was during the severe shock that occurred in the south of Italy and Sicily on the night of the 12th of October, 1835. That earthquake travelled about 100 miles in half an hour, and destroyed several towns and villages in its course. At Messina, where we were at the time, the shock was powerful, but did no mischief, and it was followed by a rapid series of sudden and loud explosions.

There is no physical cause with which we are acquainted, the operation of which would explain the phenomena of earthquakes so well as the generation of a large body of vapour within the crust of the earth; and there is no vapour so likely to be produced there as that of water, which requires heat for its production; and thus we have another argument for the existence of central heat.

III.—THE STRUCTURE OF ROCKS OF IGNEOUS FORMATION.

Those of the secondary class,—the Basalt, Greenstone, Porphyries, &c.,—have evidently come up from underneath the stratified secondary rocks at a period long posterior to the deposition of these; and as they bear every mark of having ascended in a state of fusion, or nearly so, they become, as it were, existing witnesses to the fact, that there is a very high temperature beneath the crust of the earth, and that melted rock has been in existence at no great depth below the earth's surface, long after it had become the habitation of organized beings.

IV.—HOT SPRINGS.

This is an argument of considerable force, and one worthy of consideration. In many parts of the world there exist springs of water of a temperature much higher than the average temperature of the climate, and varying from a few degrees to the boiling point.

Boiling springs, however, generally, if not always, occur near volcanoes, and must, therefore, be referred to the operation of those causes from which the latter take origin. The most remarkable of these springs are the Geysers in Iceland, which throw out from time to time very large quantities of steam and boiling water. In the Solfaterra near Naples, steam issues from the ground in such quantities, as to be used in carrying on some branches of chemical manufacture. We do not, however, adduce these instances to favour the theory for the reasons just given.

There are other springs scattered over the world, the high temperature of which would be difficult to account for on any known chemical cause. We are quite aware that it has been usual to attribute their heat to some process going on within the crust of the earth, similar to what takes place in the laboratory. But a careful examination of the facts as they come before us, will soon prove that we must resort to some other mode of explanation.

The Carlsbad waters reach the surface with a temperature of 165° F. In 2,000 parts of the water are contained—carbonate of lime, 1 part; carbonate of soda, 3 parts; sulphate of soda, 5½ parts; muriate of soda, 2½ parts; and carbonic acid, 4 parts. Now, if we examine these constituents, and ask ourselves whether any or all of them could generate such a temperature, or are likely to be concomitants of such a temperature, we shall find the lime alone is likely to be the cause; for we do know that water, when brought into contact with quicklime, has its temperature raised to the boiling point. The chemical constitution of the water itself, however, will not bear out the hypothesis There is carbonate of soda in it which ought to have given up its carbonic acid to the lime, and come up in the state of pure soda; and, besides, the lime itself exists in the water as a carbonate, which is also against the theory; for were the theory correct, it ought to exist as pure lime. The waters of Aix-la-Chapelle are at the temperature of 143° F., and those of Bath at 114° F. But, even granting the correctness of the assumption, that the heat is owing to the slaking of beds of quicklime deep in the earth, the question would still return upon us; How did these beds become calcined; and why do they not send up the water at a boiling heat, as they ought to do?

Hot springs, then, evince the existence of a heating cause deep in the bowels of the earth; and their wide distribution tends to prove the wide distribution of that cause. There is one point in regard to hot springs that requires notice, and that is their varying temperature. But we shall afterwards see how far this can be accounted for by the doctrine of the central heat, and whether this variety may not be an important evidence of the fact.

V.—THE TEMPERATURE OF MINES INCREASING IN PROPORTION TO THEIR DEPTH.

This argument is of modern date, and is of more value than any of the others. All those already stated go only to prove the existence of heat beneath the surface. But if we find from the temperature of mines and subterranean springs that the heat of the earth's crust increases downwards in a constant ratio, we then have more reason than ever to attribute the phenomenon to internal heat.

Numerous experiments have of late been made in order to determine the rate of increase, and to deduce from thence the thickness of the earth's crust. These have been made in different parts of Europe, and if there be no undiscovered source of error to vitiate the results, they establish a constant rate of increase from above downwards at the rate of 1° F. for every 45 feet of descent, or thereabouts. In the Artesian well in the Place de Grenelle at Paris, the temperature at the depth of 1,230 feet was 23° R., or 84° F. This, however, is not the highest temperature that has been observed, for it was stated by Mr. Fox, at a meeting of the British Association, that he had observed the temperature in the Cornish mines as high as 92° F. Various theories have been brought forward to explain this remarkable circumstance. The temperature has been attributed to the animal heat of the workmen employed in the mines, and to the heat disengaged from the atmospheric air in its passage down the shaft from a rarer to a denser condition, which change is accompanied by the evolution of heat. But these and all similar explanations must give way before the fact, that the same temperature is found in water springs in the mines as in the rock itself, and, besides, if a hole be bored deep into the floor of the mine, the heat is still there. The temperature of the bore at Paris also proves the existence of heat apart from any of the causes to which it has been attributed. A more likely source of error than any of the others is that arising from the absorption of oxygen by the metallic sulphurets in mines, which evolves a great quantity of caloric; but this will not explain the temperature of water springs, in situations where no sulphurets exist. It is quite clear, then, that no known chemical cause will explain the phenomenon, and that when taken in connection with the other facts stated above, these later discoveries strongly bear upon the theory under discussion.

THE SIXTH AND LAST ARGUMENT.—THE OBLATE SPHEROIDAL FORM OF THE EARTH.

The shape of the earth is just what it ought to have been, provided it had been originally fluid; its equatorial diameter exceeding its polar diameter by about 27 miles. In summing up the evidence, we have the most indubitable proof, namely, ocular demonstration, that there exists a heating cause deep in the earth, that can fuse and force solid rocks up to the surface. We find that

this cause exists over the whole surface of the globe. We find, also, that when experiments are made,—when we excavate the earth's crust, and measure the heat as we descend,—that it increases in a certain ratio. And the only question left for discussion is, whether, on taking all this evidence together, we should admit the correctness of the theory, or whether we should with more caution wait until careful investigation has removed every possible source of error. Considering the magnitude of the subject, we should be inclined to adopt the latter course; but this shall not prevent us from making the supposition that the theory is true, because, by applying it to the solution of several problems in geology, we shall have fresh opportunities of testing its probability.

Before doing so, however, it may be as well to mention the bold speculation of Herschel, Laplace, and other modern philosophers, in regard to the formation of planetary bodies, because it has a close connection with our present subject, and is, as it were, the foundation of it. This speculation rests on certain sublime and, as yet, unexplained discoveries in astronomy. It has been observed, that many of the fixed stars, when examined with the teleseope, appear like brilliant points surrounded by an extensive nebulous appearance. This is one of the facts on which the speculation rests. Another is as follows:—When we examine the crust of the earth, we find that it consists almost entirely of metallic oxides, and that by far the greatest proportion of its bulk is composed of four of these—silica, alumina, magnesia, and lime. But these four oxides consist of the metals silicium, aluminum, magnesium, and calcium, united on an average with 43 per cent. of oxygen. Now we know that very high temperatures are unfavourable to the union of this gas with metals; and we also know, that great heat can raise metals themselves into vapour; and when we take these facts along with another, namely, that the oxygen united with those oxides which constitute the crust of the earth, would, in a separate state, occupy above 2,000 times the space it now occupies, we shall at once perceive, that under the action of the high primeval temperature supposed, this globe would put on an appearance not very dissimilar to that presented by the fixed stars in the instances already alluded to. All this, however, is nothing more than speculation; perhaps carried to a greater extent than our present degree of knowledge warrants. We thought it, however, right to mention it, and shall now proceed with our subject.

The theory, then, is,—That before the arrangement of the earth into that complex and magnificent structure which it now presents, it consisted of a round mass of incandescent liquid matter, hung in space, under the operation of no force except the innate gravitation of its parts to each other. This principle of gravitation did not exist equally in all the parts, but was a property possessed in a greater degree by some than by others. These are the two fundamental suppositions, and, granting their accuracy, let us examine what would take place. The first and most marked effect would be the arrangement of the particles according to the ratio of their respective gravities. There would be accumulated round the central nucleus the fluid rock, which now constitutes the interior part of the earth. Above that there would exist all those metals as metallic oxides, which can be raised into vapour at a high heat. Next we should have the great body of waters existing as highly rarefied vapour, and forming a vast atmosphere enveloping the incandescent globe beneath, and, above all, the air would be expanded out into space to an almost unlimited sense, at least, comparatively speaking.

Let us next examine what would take place subsequent to this arrangement. All heated bodies, when suspended in space, radiate their heat in all directions, and the earth would do the same. The radiation would be assisted in reducing the temperature of the mass by another agent, namely, atmospheric currents. Air and watery vapour have their specific gravity increased by cold and diminished by heat, and this law being in operation, would act as follows:—The strata of vapour in contact with the incandescent surface would have their temperature higher than those at a great height above it, and would be consequently pressed upwards, and would carry their heat along with them into the higher regions of the atmosphere, where it would be lost by radiation into space; while the colder and denser strata from above would come in contact with the surface in their turn, and would get heated and be pressed upwards by other strata in succession. Now, under the operation of these two causes, it is easy to perceive, that in the lapse of time the surface of the globe would have its temperature very much reduced, and if the materials were good conductors of heat, there would be no formation of a crust, because as fast as the caloric of fluidity was lost by radiation, it would be supplied from below, and thus the process would go on until the temperature of the whole mass was reduced to the same standard, and until it became solid throughout. When, however, we examine the materials which compose the crust, we find that they are bad conductors of heat, and this fact being established, let us examine how far the cooling process would be modified by it.

The quantity of heat lost by radiation would be greater than the quantity derived from below, and a time would arrive when the whole caloric of fluidity would be carried off from the outer stratum, and it would be solidified. This would be the commencement of a crust. And now the temperature being considerably lowered, certain changes would take place in the gaseous covering. The first of these would be the deposition of the metals and metallic calces and sulphurets. But there would as yet be no deposition of moisture until the temperature fell below 212° F. When, however, this took place, water would be formed by the condensation of the vapour in the atmosphere, and would fall in rain. This would lower the temperature of the surface at once, because water, in the act of passing into vapour, absorbs a prodigious quantity of heat, which it would carry upwards with it until it lost it by radiation, and it would then again fall back in rain as before, and the process of cooling would in this way advance with greater rapidity. From this operation the surface itself would also begin to present certain phenomena. We have said that the materials of the earth's crust are bad conductors—and we know that bad conductors, if suddenly cooled, are broken into fragments. May the lower stratum of rock not have been disintegrated in this way? If so, the fragments would arrange themselves into regular strata, such as we observe among the more recent primitive rocks.

And now we should have another great physical law brought into operation, namely, the law of contraction from diminished temperature. And this would be productive of some great revolutions on the new formed surface of the globe.

As the crust became cooled down, its internal capacity would be diminished by contraction, and as it could not compress the fluid contents into a smaller space, it would itself give way, and large rents and fissures would ensue. And this would give rise to a new class of phenomena. The first and most obvious of these would be the projection of a quantity of water through the rents upon the melted matter beneath, and the consequent generation of a prodigious quantity of steam, under a great temperature and pressure; and the first effect of this generation of elastic force would be the disruption and upheaving of the crust into new and strange positions, while the rents would be filled up by the fiery tide from below, and which, in some instances, would overflow the already consolidated strata, and this melted matter would have a different mechanical constitution, from its cooling more rapidly than the already formed crust had done.

Volcanoes may have established themselves about this time, and would lessen the violence of subsequent occurrences of the same kind, by affording a ready vent to the vapours afterwards generated. These, however, would happen by successive contractions of the earth's crust, and would give rise to some elevated ridges as tracts on the surface. We may suppose this to constitute the primitive period, at the conclusion of which organic beings were placed on the globe, and shall now proceed to examine in detail certain geological phenomena, which will shew how far the theory throws light upon them.

1. THICKNESS OF THE CRUST OF THE EARTH.

The first investigation of importance that presents itself is the thickness of the crust on which we dwell. We have seen by the theory that this ought to be continually increasing, though with exceeding slowness, and that there was a time when it was so thin as to be almost in a state of fusion. We have stated that the increase of temperature observed is about 1 degree Fahr., for every fifteen yards of descent. In all probability, however, the increase will yet be found to be in a geometrical progression, as investigation is extended; in which case the present crust will be found to be much thinner than we have calculated it to be—and should this be found to be correct, the igneous theory will become a subject of much more importance, in a geological point of view, than we are at present disposed to consider it. Taking, then, as correct, the present observed rate of increase, the temperature would be as follows:—

Water will boil at the depth of 2430 yards.
Lead melts at the depth of 8400 yards.
There is red heat at the depth of 7 miles.
Gold melts at 21 miles.
Cast iron at 74 miles.
Soft iron at 97 miles.

And at the depth of 100 miles there is a temperature equal to the greatest artificial heat yet observed; a temperature capable of fusing platinum, porcelain, and indeed every refractory substance we are acquainted with. These temperatures are calculated from Guyton Morveau's corrected scale of Wedgewood's pyrometer, and if we adopt them, we find that the earth is fluid at the depth of 100 miles from the surface, and that even in its present state very little more than the soil on which we tread is fit for the habitation of organized beings.

As the cooling of the crust is a progressive action, there must have been a time when the crust was very much thinner than it is at present, and during those earlier periods changes in its condition from contraction must have been very frequent, because every new layer, as it cooled beneath, would contract and compress the fluid part below, and in the effort would be rent in many places. It appears as if several of these rents were still in existence. There seems to be a great one passing from the West Indies down the coast of South America, and across the Pacific. It has a long line of volcanoes marking its course, and those districts seated over it are the very abodes of earthquake violence. Not many years ago a great shock passed through that region, and a mountain in the island of Java sunk into the fiery abyss with all its inhabitants, and left a burning lake to occupy its place.

2. SECONDARY FORMATIONS.

We have already pointed out certain probable occurrences as explanatory of the formation of the primitive rocks, and shall now proceed to those of the secondary class. The sandstones appear to have originated from the disintegration of the older formations, but the limestones are more difficult to account for. The only supposition in connection with this theory that appears to explain their existence is, that they were deposited in an amorphous form from the fiery atmosphere that enveloped the original nucleus, at a period subsequent to the deposition of the silicious oxides. Two things are certain, in regard to these formations. First, that they were arranged in their *present* state by the action of water; and secondly, that they were deposited after the creation of organized beings. And from these facts follows a conclusion that is of grave importance in geology at the present time, namely: that this deposition must have taken place after the temperature of the surface had fallen below 212° F., the boiling point of water. This conclusion is irresistible, and if we connect this with the present position of the boiling point of water in the earth's crust, we shall find ourselves rather in a difficulty in regard to those immense geological periods of time which modern science thinks she has proved to be necessary to the develop-

ment of the present order of things. This is so important a consideration, that we shall be a little more particular about it. Organic life, such as then existed, at the present day finds its limits in a temperature below 100° F. We shall, however, take 100° as the average heat of the waters of the primeval ocean at the time of the creation of organized beings, and consequently before the deposition of those secondary strata in which their remains are found. There could then have been no life, and consequently no organic remains, before the heat of the crust, and consequently of the ocean, fell to this point. From the continued currents in the sea, it is very difficult to ascertain its present heat at the bottom; but from an experiment of Captain Sabine, in November 1822, in lat. 20½° N. and 83½° W. longitude, the temperate at the depth of 6000 feet was 45½° F. We shall take 50° as the average of the temperature of the bottom of the sea. Now we have seen that the temperature in the same situation, at the time of the deposition of the secondary rocks, could not have been above 100° F., which is 50° more; and the question now is, how long would it take to radiate from the surface of the earth that quantity of heat that would be necessary to admit of this reduction of 50°? By the usual rate of increase, we find that at the depth of 750 yards from the present surface, there is a temperature of 100° F., and this is just 8° higher than has been observed by Mr. Fox in the Cornish mines; so that the time which has elapsed since the deposition of the secondary strata is just the time that has elapsed since the heat of 100° F. travelled from the surface to the depth of 750 yards. What this time is, experiment and careful induction can alone determine; but, *à priori*, it does not certainly appear likely to have occupied those thousands of ages that have been allotted to the production of the strata under discussion.

If we examine the stratification of the secondary series, we perceive some very remarkable appearances. The strata are bent and waved in every direction, and these waves vary in depth from five to ten miles, which is the maximum depth to which they descend beneath the surface. This is determined by the depth of the strata. We also find rents and shifts of great extent. These waves and shifts pervade the whole formation, and this almost envelopes the globe like a shell. On taking a comprehensive view, it looks like a covering too large for the globe contained within it. Let us now examine whether there be any part of the igneous theory which will explain this appearance. We have seen that this formation was deposited after the completion of the primitive period, and after the earth's crust had become fit for the habitation of organized beings. During all this period the refrigerating process would still go on, and stratum after stratum would become cooled and contracted, until in the course of time the whole central mass would occupy less space than it did at first, and the consequence would be, the bending and waving of the rigid crust, and consequently the displacement of the strata laid upon it, so as to accommodate themselves to the altered size of the mass of the globe within, which thus might give rise to the appearance described. Even in modern times the same action may be going on. The earth still radiates heat and is cooled and contracted, and as the crust cannot follow the contraction, because it is rigid, there will still be bendings and derangements, such as shifts and raisings of strata, which may be observed all over the world.

IGNEOUS ROCKS.

From what has been already said, there will be no difficulty in explaining the appearances of the igneous rocks from the theory of central heat. Indeed, these have always been strong arguments in favour of it. They are supposed to have come up from below, and to consist either of the central hot matter, or of primitive rocks melted and protruded from below. Their appearance is rather against this supposition; but it ought to be kept in mind that this depends entirely on the rate of cooling. Basalt and greenstone, if melted, may be formed into bottles, which are perfect glass if cooled rapidly, but if slowly, they form a grey crystalline stone. Their own natural semi-vitreous aspect would lead us to believe that they had been protruded into the ocean and cooled rapidly, while the stony aspect of the porphyries would lead us to think that they had been thrown up on the land, and cooled gradually.

VOLCANOES.

Volcanoes appear to be the natural vents by which vapours of various kinds escape, which might otherwise cause disturbances in the crust of the earth. The application of the igneous theory to the explanation of these will not be difficult. Let us suppose them to exist over a rent in the crust which descends through its whole depth to the fiery gulph below, and then we shall have a ready explanation of many of the phenomena. Others, however, appear to have their origin nearer the surface—such as the periodical discharges of lava, the emission of watery vapour, and of muriatic acid, and the existence of flame. Before lava can flow over the crater of a volcano, the pressure it would exert on the inner surface of the crust would be 400 tons on the square inch.

EARTHQUAKES AND HOT SPRINGS.

An earthquake essentially consists in the rapid trembling or vibration of the superficial strata, the vibrations being from a quarter of an inch to several inches in length. Various theories have been proposed at different times to account for them, but the theory of the central heat affords a more easy explanation than any other. We have already stated that the strata of the secondary formation proceed downwards below the surface to the depth of ten miles, but as red heat exists at the depth of seven miles, the lower strata must be at a very high temperature. We all know the ease with which water descends between the strata of any rock, and if it arrive, as it may very easily do, between the secondary strata to the point even where water boils, namely, less than half a mile, steam will be generated. This will separate the strata a little further; more water will sink down, until at last an expansive force is generated, sufficiently great to heave up the superincumbent strata; and when steam escapes, either by a volcanic rent or into the bottom of the sea, we shall have that rapid vibratory motion produced which constitutes the earthquake.

Hot springs may be explained on the same principle, only the water does not arrive at so great a depth before it is again returned to the surface. The Carlsbad waters would, according to this theory, come from the depth of 1625 yards, and those of Bath from a depth of 960 yards. Hot springs generally occur where there are fractures and dislocations of the strata, whereby the continuity is destroyed, and water rises to the surface through the dislocation.

By extending this hypothesis, many more phenomena might be brought under it; but our present object has been only to call attention to a theory which has been handed down to us from the remotest antiquity, in support of which much further evidence might be adduced.

CASCARA DE LINGUE AND DE PINGUE.

By Dr. L. F. Bley.

These substances are said to contain, according to communications from Mexico, very much tannine, and are stated to produce the same effect in six weeks as oak-bark in a year.

Both substances were unknown to Professor Martius. The latter appeared to him to bear great resemblance to the root of a species of *Curcuma*, and to belong, therefore, to the *Scitamineæ*.

Physical Description of the Cascara de Lingue. This bark occurs in fragments of one to three inches in length, and a quarter to an inch in breadth, and from two to three lines in thickness; it is partially provided with an epidermis, upon which, at some spots, whitish-green lichens occur. The colour of the bark on its outer surface is greyish-brown; the lichens, however, render it whitish-grey. The outer bark is unequal and full of fissures. The upper cortical layer is about the thickness of writing-paper; beneath it is a reddish-brown membrane of about half the thickness, which is here and there provided with warty prominences. The true bark is situated beneath these; it is of the colour and appearance of *Cinchona regia*, and, like this, is but slightly tubular, with a rough fracture. Its odour resembles, in some degree, the true barks, but its taste is astringent, somewhat mucous, but not at all bitter. The powder resembles that of the *Cinchona regia*; when ignited it gives off vapours which slightly irritate the eyes, leaves behind a somewhat shining coal, and, finally, a delicate white ash (amounting to about 6 per cent. of the bark), which has a faintly-alkaline taste, and was found, on examination, to consist of chloride of potassium, sulphate of lime, traces of carbonate of magnesia, and carbonate of potash.

Treatment with Water.—1 oz. of the coarsely-powdered bark was boiled with 12 oz. of distilled water down to 4. The decoction possessed a wine-red colour, no odour, but a very astringent taste. It reddened blue litmus-paper slightly, gave a white precipitate with nitrate of silver, was scarcely rendered turbid by a solution of a salt of barytes, became opake with oxalate of potash, gave a considerable precipitate with perchloride of mercury, and also with nitrate of lead. Chloride of gold produced a dark bluish-black colour, perchloride of iron a blackish-blue precipitate, solution of isinglass a very considerable bluish precipitate, tincture of iodine a violet-blue precipitate, tincture of galls no opacity. The decoction afforded, on evaporation, a brownish extract, which was partly re-dissolved by alcohol, and which left behind, on evaparation, a small quantity of a pale brown resin, of a somewhat irritating, slightly astringent taste. The portion not dissolved by the alcohol consisted of tannine and gum, with traces of salts and starch, of which 1 oz. of bark afforded 28 grs. The gum and tannine were separated by means of aqueous alcohol, which left the gum undissolved; this was then shaken with cold water, in which it dissolved, while starch remained in part behind, or subsequently separated from the dilute solution. The quantity of tannine amounted, approximatively, to 55·0 grs.

Another experiment was made to determine the tannine; 1 oz. of the bark was exhausted by boiling with distilled water, the liquid evaporated to 4 oz., the decoction strained quickly through dry paper, and solution of acetate of iron added to it as long as it afforded a precipitate. This was then collected on a filter which had been weighed, the precipitate edulcorated with acidulated water, dried with the filter and weighed; 108 grs. of tannate of iron were obtained.

For the sake of comparison, similar quantities of gall-apples, oak-bark, and rhatany root were submitted to the same process. The oak-bark gave 98 grs. of tannate of iron, the galls 251·0 grs., the rhatany bark 104·5 grs. But according to experiment, 100 parts tannate of iron correspond to 53·67 grs. tannine, so that we can easily judge of the value of the bark for purposes of tanning.

To oak-bark it is as	14·5 : 13
To gall-apples as	14.5 : 33·5
And to the rhatany as . . .	14·5 : 13·75

Treatment with Alcohol.—The residuous bark from the aqueous extract, digested with alcohol, afforded 9·0 grs. of a reddish-brown extract, of a fatty, astringent, and at the same time irritating taste. The extract melted on being heated, burnt with flame, giving off vapours which excited coughing. Water removed from it 4 grs. of an extract containing tannine. The residuous 5 grs. behaved like a soft resin, and possessed a very irritating taste. Ether removed from the residue of the bark a trace of a yellow fatty substance. *Cascara de Lingue* contains therefore tannine, gum, salts, starch, soft resin, vegetable fibre, and water.

Physical Characters of Cascara de Pinguc.—This substance which, according to Prof. Martius's information, is probably the fragments of a root, perhaps of a *Curcuma*, and belongs to the family of the *Scitamineæ*, occurs in fragments of from half an inch to one inch and a quarter in length, a quarter to one inch in breadth, and from four to six lines in thickness, of greyish-yellow colour, inclining in some places to green. At a few places only is the epidermis visible; its colour is greenish-yellow, with here and there black spots. The surface is fissured and warty;

fracture uneven, not fibrous. It has no perceptible odour; the taste is somewhat mucous and very astringent; the powder is yellowish-green. When burnt, it smells like fresh-roasted acorns. The ash is white, and possesses a somewhat saline, earthy taste. It contains a little carbonate of magnesia, a little carbonate of lime, much chloride of potassium and sulphate of potash.

Aqueous Extract.—The decoction of the same strength as the preceding exhibited the following properties:—Colour wine-red, but more brownish; no perceptible odour; taste astringent; it turns blue litmus-paper strongly red. Salts of silver give a grey precipitate, salts of barytes a considerable grey precipitate, oxalate of ammonia causes turbidness, lime water a considerable dirty white precipitate, perchloride of iron a greenish-grey precipitate, perchloride of mercury scarcely any turbidness, nitrate of lead a dirty greyish-yellow flocculent precipitate, solution of isinglass considerable precipitate, tincture of galls considerable turbidness, tincture of iodine a pale violet precipitate.

A dark brown extract, of a very highly astringent taste, was obtained from a decoction, on evaporation, from which alcohol removed a small quantity of a light brown resin. Gum, tannine, starch (the quantity of which amounted in an ounce of the root to 24 grs.), muriate of lime, chloride of potassium, as well as traces of sulphate of potash, were separated from the aqueous extract. The quantity of the tannate of iron from 1 oz. of the vegetable substance amounted to 153·0 grs.; it is, therefore, to the *Cascara de Lingue* as 20·52 : 14·5, to oak-bark as 20·52 : 13, to galls as 20·52 : 33·5, to rhatany as 20·52 : 13·75.

Alcoholic Extract.—Exhaustion with alcohol afforded a greenish-brown extract, weighing 140 grs., of a resinous, astringent taste. Held over the flame it melted, became liquid, burnt with flame, puffing up somewhat. The residuous resin was of a bright yellow colour, of solid consistence, of an acid reaction, and partially soluble in ether. Ether removed from the residuous vegetable matters a small quantity of a yellow matter. The following substances occur, therefore, according to these experiments, in the *Caseara de Pingue*:—Tannine, gum, starch, resin, muriate and sulphate of potash, and salts of lime, vegetable fibre and water. With respect to the amount of tannine, it even surpasses the *Cascara de Lingue*. *Archiv. der Pharm.*, and *Chemical Gazette.*

CHEMICAL PREPARATIONS.

ON THE PREPARATION OF PHARMACEUTICAL EXTRACTS.

By M. Burin.

The method which I propose is founded on the following principles:—

1. A vegetable substance being given, endeavour to ascertain which, among the substances indicated as components by analysis, are those to which the medical action possessed by the substance itself should be attributed.

2. The active principles being known, investigate their chemical properties, in order to ascertain, among other things, what solvents should be employed to separate them, as much as possible, from those which are inert, and which on that account might prevent the preservation of the product, and destroy the energy of its properties.

3. Such a process of evaporation of the liquid parts as will most completely avoid the decomposing action which organic bodies so readily undergo in contact with chemical agents—such as heat, air, or water.

I will here detail the mode of proceeding, based upon these principles, which I have adopted for preparing some extracts, selected from among those which are the most frequently employed:—

Belladonna, Stramonium, Hyoseyamus.

Most of the *solaneæ*, and the above in particular, contain active principles, the chemical characters of which, and their effects on the animal economy, present the greatest resemblance.

To prepare the extracts of belladonna, stramonium, hyoscyamus, and other *solaneæ*, I take equal parts of leaves and branches at the commencement of the flowering season, and of alcohol of sp. gr. 0·834.

The plant is crushed with care in a marble mortar, expressed with the hands, then again submitted to the action of the pestle; the juice thus obtained is subsequently again mixed with the plant, the alcohol added, and left to macerate for six days. The whole is then thrown on a strainer, and the residue submitted to the action of a powerful press. The combined and filtered liquids are subsequently distilled *in vacuo*, if possible, if not in a water-bath, to remove all the alcohol (by distillation in the water-bath the product undergoes no alteration, as the evaporation takes place beyond the influence of the air). The residue is set aside to cool, and then filtered to separate the chlorophylle which has subsided; it is then evaporated *in vacuo*, or, if the necessary apparatus is not at hand, the product is divided into layers of about four-fifths of an inch in thickness, in large tin moulds which have been rubbed with mercury, and left to spontaneous evaporation, in a hot chamber, with a constant current of air, at a temperature of 95° to 104°. When the extract has acquired the consistence of honey, it is again dissolved in three times its weight of alcohol of 0·834, filtered, distilled over the water-bath to remove two-thirds of the alcohol, and the evaporation completed in the hot chamber.

The product should be preserved in closely-stoppered bottles.

The object of dissolving the spirituous extract in concentrated alcohol is to separate a certain quantity of salts soluble in weak alcohol, and likewise the inert colouring matter of the extract. This process, however, is not new; it has, in fact, been already employed by M. Dublanc for extract of lettuce, by M. Lombard for extract of aconite; lastly, MM. Georges and Hespe have advised its being employed in preparing aqueous extracts of hyoscyamus, and other *solaneæ*, from the dry plant.

The extracts of these three plants, prepared as above described, have a purple yellow colour when spread out in thin layers, and possess the peculiar odour of the plant; they taste at first acrid, the mouth then becomes dry and clammy, with a feeling of constriction of the back of the throat, which is accompanied with an effect on the brain similar to that which is caused by a small quantity of tobacco-smoke to a person unaccustomed to it. They dilate the pupil.

A portion of the extract represents the principles which are soluble in water and in alcohol:—

Of fresh belladonna .	88 parts, or	12 of powder.
Of stramonium . .	110 . .	12 . .
Of hyoscyamus . .	105 . .	16 . .

It is composed of yellow extractive, a complex body which retains a certain quantity of the odoriferous volatile oily liquid, and the whole of the crystalline, alkaline substance, or active principle of the plant, in a state of preservation, which should be considered as perfectly normal, all chances of alteration, which might have resulted either from the mode of operation or the method of evaporation, having been avoided as completely as possible.

Extract of Gentian.

The observations of MM. Planche, Henri, and Caventou, and of M. Leconte, have shewn the existence of the following substances in gentian:—

A volatile, odoriferous principle, gentisine, caoutchouc, a green oily substance, uncrystallizable sugar, gum, pectic acid, fawn-coloured colouring substance, organic acid, and bitter extractive substance.

MM. Henri and Caventou extracted a crystalline substance from gentian, which they considered, under the name of gentianine, to be the bitter principle of the gentian; but this substance, or the gentisine, is, according to MM. Leconte and Trommsdorff, nothing more than a pale yellow colouring substance, which crystallizes in long needles, is insipid and inodorous, and which is mixed in the gentianine with variable proportions of the bitter principle and fatty matter.

From these facts it results that the chemical nature of the bitter substance of the gentian has still to be determined; and it will presently be seen that, as obtained at present, it exhibits the form of an extractive matter, uncrystallizable, and very soluble in alcohol.

Gentian is exhausted by Cadet's process, in three successive treatments, with twice its weight of alcohol of 0·834. The liquids are combined and distilled over the water-bath, to remove the whole of the alcohol; the extract obtained is dissolved in distilled water, which takes up the bitter substance, sugar, and free acid, and leaves behind the fatty matter combined with gentisine. It is filtered, evaporation completed in a warm chamber, and, when the product has been reduced to the consistence of a thick syrup, it is spread in thin layers, by means of a brush, on plates of tin which have been rubbed with mercury, and then slightly wiped over with a piece of linen moistened with a very small quantity of oil of almonds. When the extract is dry, it suffices to knock the back of the tin plate to remove it in beautiful, transparent, yellow laminæ, which should be preserved with care in well-stoppered bottles.

This extract contains the aromatic bitter substance, the sugar, free acid, and probably also a certain quantity of gentisine retained by the bitter principle. It represents the active principles of the gentian in a state of great concentration, and may form the basis of excellent preparations.

One part of the extract is exactly equivalent to ten parts of the gentian root.

Extract of Digitalis.

As with gentian, three successive digestions in alcohol of 0·834 entirely exhaust the digitalis of all its bitter and odoriferous constituents; the liquids are mixed, two or three quarts of distilled water added, or more, according to the quantity of substance under treatment. [The object of adding this water is to divide the chlorophylle, which otherwise carries down with it a considerable quantity of the active principles.] It is then distilled over the water-bath to remove the alcohol, allowed to cool, and filtered to separate the chlorophylle. Treated in the same manner as the gentian, a dry extract is obtained, in the form of beautiful transparent laminæ, which are very slightly coloured, and possess, in the highest degree, the bitter taste and peculiar odour of digitalis; the odour is rendered very perceptible on rubbing the extract, or on moistening it with a little water. There can be no doubt that this extract is highly energetic and preferable to every other, and that, in the hands of a good practitioner, it will form the base of preparations of uniform effect.

2¼ lbs. of pulverized digitalis afforded 108 grms. of dry extract; but taking into consideration the inevitable losses in operating upon larger quantities, it may be admitted that one part of extract is equivalent to ten parts of dry plant.

This extract should not be substituted for the ordinary extracts of digitalis, except when specially ordered.

Extract of Valerian.

Valerian root contains, according to an analysis of M. Trommsdorff.

Volatile oil	Soluble in alcohol.
Resin	
Peculiar volatile acid (valerianic acid)	
Aqueous extractive . . .	Soluble in water.
Peculiar substance . . .	
Starch	

Experience has shewn that the votatile oil, the valerianic acid, and the resin, are essentially the active principles of the valerian; on the other hand, the aqueous extract is not without action; in this case, therefore, as much as possible of the first three substances, the solvent for which is concentrated alcohol, should be introduced into the product, and a certain proportion of those which are likewise soluble in water equally admitted.

The following is the process which I advise:—The coarsely-powdered valerian is moistened with twice its weight of alcohol of 0·834 sp. gr. After three days' contact the mixture is conveyed into a displacement apparatus, and treated with an equal weight of alcohol of 0·915 sp. gr.; on distilling the first product over the water-bath, the

residue obtained is a mixture composed almost entirely of a dark green resin, holding in solution the entire amount of the volatile oil and of the valerianic acid. This product is placed aside in a well-stoppered bottle, the alcohol obtained by distillation is diluted with distilled water to reduce it to 0·915 sp. gr., and, if necessary, fresh alcohol of the same specific gravity added sufficient to exhaust the valerian. The liquors are mixed, filtered, the whole of the alcohol removed by distillation, and the residue evaporated in the hot chamber to a pillular consistence; the first product is then incorporated with it, and thus a homogeneous mass obtained, containing in a perfect state all the active parts of the valerian root.

One part of extract is equivalent to five parts of the root.—*Journ. de Pharm.*, for May.

OBSERVATIONS ON THE PRECEDING ARTICLE. BY M. SOUBEIRAN.

The object to be attained in the preparation of extracts is to concentrate in a small mass the active parts of plants, without at all altering the state of combination in which they naturally occur. M. Burin proposes to extend the use of concentrated alcohol, already previously recommended, in order to concentrate the active and to remove the inert principles of vegetables. This object seems to be attained with respect to the *solaneæ*, but is it equally so for the other plants selected by M. Burin? I will here detail two series of experiments, the one relative to valerian, the other to gentian. I operated on the same root in each experiment, so as to have comparative results.

Extract of Valerian.

PROCESS OF M. BURIN.

(2¼ lbs. of substance.)

Extract obtained.	Relation to the substance.	Water dissolves	Alcohol of 0·921 dissolves	Alcohol of 0·834 dissolves
225 grs.	: 1 :: 4	80 p. c.	80 p. c.	96 p. c.

PROCESS OF THE CODEX.

(2¼ lbs. of substance.)

Extract obtained.	Relation to the substance.	Water dissolves	Alcohol of 0·921 dissolves	Alcohol of 0 834 dissolves
205 grs.	: 1 :: 4·83	80 p. c.	94 p. c.	80 p. c.

These two extracts were both very aromatic; that of the Codex, however, was the least so, and its colour was darker. I diluted them with water, and obtained the following results:—

EXTRACT BY M. BURIN'S PROCESS, DILUTED
800 times, specified odour destroyed.
1000 times, specified taste destroyed
2000 times, bitterness destroyed.

EXTRACT OF THE CODEX,
400 times, specified odour destroyed.
800 times, specified taste destroyed.
1000 times, bitterness destroyed.

The substitution of alcohol of 0·834 sp. gr. for alcohol of 0·921 does not offer, therefore, any great advantage.

Extract of Gentian.

PROCESS OF M. BURIN.

(2¼ lbs of substance.)

Extract obtained.	Relation to the substance.	Water dissolves	Alcohol of 0·921 dissolves	Alcohol of 0·834 dissolves
112 grs.	: 1 :: 8·9	the whole, except some flakes	entirely.	96 p. c.

PROCESS OF THE CODEX.

(2¼ lbs. of substance.)

Extract obtained.	Relation to the substance.	Water dissolves	Alcohol of 0·921 dissolves	Alcohol of 0·934 dissolves
364 grs.	: 1 :: 2·75	98 p. c.	85 p. c.	20 p. c.

EXTRACT BY M. BURIN'S PROCESS, DILUTED
10,000 times, still very bitter.
20,000 times, distinctly bitter.

EXTRACT OF THE CODEX,
4,000 times, decidedly bitter.
20,000 times, bitterness destroyed.

The extract with alcohol of 0·834 sp. gr. contains the bitter principle in a state of greater concentration; but what is the cost of this advantage? Three times less product is obtained. Now alcohol of 0·834 is not a very proper vehicle for removing the bitter principles from the root of gentian; when it ceases to act, alcohol of 0·921 takes up a considerable quantity of those active parts; it is, therefore, undoubtedly preferable for the preparation of extracts.

These two examples suffice to show all the inconveniences which might result from adopting an absolute principle, and extending its application. In extracting the soluble substances contained in plants, it should not be forgotten that the solubility peculiar to each of their isolated principles is no longer the same when several are associated, and that we should not judge, *à priori*, of the action of solvents on each of them.—*Journ. de Pharm. et de Chim.*, May, 1844.

Preparation of Butyric Ether.

This ether, which possesses in so remarkable a degree the pleasant odour of apples, is at present very much used as aroma in the manufacture of rum. It is very readily obtained for this purpose, dissolved in alcohol, on saponifying butter with a concentrated solution of caustic potash, dissolving the soap in the smallest requisite quantity of strong alcohol with the assistance of heat, adding a mixture of alcohol and sulphuric acid to this solution until it has a strong acid reaction, and then submitting it to distillation as long as the product has a fruity odour.

The pure ether may be separated from this product by repeated rectification and treatment with chloride of calcium. According to an analysis of M. Borntrager, it appears, prepared in this manner, to consist solely of the ether of butyric acid. The analysis afforded—

		Calculated according to $C^{12} H^6 O$.
Carbon	61·57	62·35
Hydrogen	10·91	10·25
Oxygen	27·52	27·40

Capronic ether contains, according to Lerch, nearly 67 per cent. carbon.—Liebig's *Annalen* for March, 1844.

Solution of Caoutchouc.

M. Heusler recommends boiling four ounces of caoutchouc with one pound and three quarters of linseed oil until perfectly dissolved, then passing through a strainer. The caoutchouc is cut into slips, and is well stirred during the boiling with an iron spatula. This varnish is well adapted for rendering shoes, &c., water-tight.—*Jahrb. für Prakt. Pharm.*, and *Chemical Gazette.*

On Tooth Powders.

Dr. HEIDER, a practical dentist of celebrity in Vienna, insists that, of the constituents of a good tooth powder, the first in importance is charcoal, especially *lime-tree charcoal.* A soft and cheap powder, it possesses the property of absorbing colouring substances, and destroying the disagreeable odour of carious teeth, and, when left in the spaces between the teeth, has a disinfecting action on the particles of food which collect there.

Next in importance is carbonate of magnesia, both for its absorbent power and extreme softness. From neutralizing acids, it deserves particular attention; and a pleasing tint may be imparted by any harmless colouring substance. The same may be said of the *lapides cancrorum*, and *creta alba præparata. Ossa sepiæ, conchæ præparatæ, corallia alba et rubra* are, as carbonate of lime, insoluble in the secretions of the mouth, but are less soft, and should, therefore, only be employed by grown-up persons, and then mixed with other powders.

Ashes are sometimes injurious, for their alkali is not neutralized by carbonic acid. Soap deserves the preference, and forms an excellent ingredient for tooth powders.

Orris-root is a harmless substance, and is generally added for its agreeable odour. Alum, cream of tartar, tartaric and citric acids, borax, chloride of lime, &c., are injurious.

The usual colouring substances are carmine, florentine lac, *sanguis draconis, bolus armeniaca, corallia rubra, coccinella, lignum Santali rubrum;* the first two give a beautiful colour in small quantities.

For smell and taste, a few grs. of vanilla, or a couple of drops of an essential oil, such as bergamot, neroli, rose oil, oil of cloves, oil of peppermint, may be added.

The best mode of application, is to clean the teeth in the evening, before going to rest, with a *soft* brush and some powder; the particles of food thus do not undergo putrefaction; otherwise, when removed in the morning, they may have already produced considerable injury.

Prof. Carabelli prescribed a grey tooth powder in the following form:—

R. Pulv. oss. Sepiæ,
Lapid. Cancrorum ana unc. unam et semis.;
Corticis Cinnamomi,
Iridis florentinæ,
Carb. Lign. Tiliæ ana drachm. tres;
Vanillæ grana decem.—Misce.

A less expensive powder is calcined oyster-shells, employed instead of *os sepiæ*, and a few drops of bergamot oil instead of vanilla.

For children, carbonate of magnesia, without addition, is best, because not liable to injure the still weak enamel; and it neutralizes the acid which frequently occurs in the secretions of the mouth in children.—*Oestr. Medicin. Wochenschrift.*

Preparation of Mercurial Ointment.

M. Heusler recommends the following method:—6 oz. of mercury, 2 oz. of suet and 6 oz. of lard are rubbed together in a shallow iron mortar, with the addition of about a drachm of sulphuric ether at intervals, until all globules have disappeared.

The process occupies about three-quarters of an hour, and the quantity of ether required is about 7 drachms.—*Jahrb. für Prakt. Pharm.*

Aqua Sinapis.

According to M. Heusler, by the distillation of 18 oz. of coarsely-powdered black mustard, with 8 oz. of alcohol, and sufficient water until 36 oz. have passed over, a liquid is obtained, which, when applied to the skin on linen moistened with it, acts more quickly and powerfully than an ordinary mustard poultice.—*Jahrb. für Prakt. Chem.*, vii, p. 368, and *Chemical Gazette.*

ON THE IMPURITY OF SOME DRUGS.

By DAVID MURDOCH, Esq.

I.—CALAMINE, OR CARBONATE OF ZINC.

As the calamine, or impure carbonate of zinc, sold in London, had been frequently examined by Dr. R. D. Thomson, and found always destitute of zinc, it became a matter of some interest to ascertain if the same remark applied to the calamine which occurs in commerce in Glasgow. Accordingly, at the request of Dr. Thomson, a specimen was subjected to analysis. The colour of this substance is well known to be a light red. When it is boiled with muriatic acid, it effervesces slightly, and becomes perfectly white, the residue consisting of a heavy white powder, which, on being heated on charcoal before the blow-pipe, and then digested in acid, gives out the smell of sulphohydric acid; and when fused with carbonate of soda and digested with water, sulphate of soda is dissolved and carbonate of barytes remains unacted on. The main constituent of the commercial calamine is thus, obviously, sulphate of barytes. To ascertain if any zinc was contained in the red powder, the acid solution which was boiled upon it was mixed with a quantity of caustic ammonia in excess, which precipitated the peroxide of iron and alumina. This precipitate was filtered, and the ammoniacal liquid which passed through the filter was precipitated by oxalate of ammonia. The oxalate of lime was thrown on a filter, and the washings evaporated to dryness and heated to low redness in a platinum capsule. No residue was left; showing the absence of zinc and magnesia.

128·05 grains of calamine gave, in one analysis, of sulphate of barytes and some silica, 128·05; peroxide of iron and alumina, 11·55 grains; water, 0·51 grains; and the results of two analyses were as follow:—

	I.	II.
Sulphate of barytes	88·74	89·77
Peroxide of iron and alumina	8·01	5·74
Carbonate of lime	2·90	4·40
Water	0·35	0·35
	100·	100·26

Dr. Thomson having suggested that the mode

in which this adulterated article was manufactured was by mixing together a portion of American bole, chalk, and sulphate of barytes; the next object was to examine American bole, for the purpose of comparison. The following are the results of several analyses of this substance, which is used extensively for colouring tooth-powders, &c., by druggists. The fourth analysis was made by my brother, Mr. James Murdoch:—

	I.	II.	III.	IV.
Silica	50·15	47·31	. .	49·38
Peroxide of iron	22·69	. .	. .	30·44
Alumina	11·46	32·96	31·	6·90
Lime	6·43	. .	. .	. .
Water	. .	. .	. .	7·04
Sulphate of lime	. .	. .	. .	8·30
Magnesia	. .	. .	. .	1·98

To determine if any silica was contained in the sulphate of barytes of the adulterated calamine, the sulphate was fused with carbonate of soda, the fused mass washed with water until the sulphate of soda was removed, and then the residue was digested in dilute muriatic acid. A portion of silica remained undissolved; the quantity was not determined, but it is obvious that the calamine contains all the substances existing in American bole, and the conclusion is scarcely avoidable that the colour is caused by the presence of this body.

II.—PRECIPITATED SULPHUR.

This substance, also termed milk of sulphur and washed sulphur, is properly prepared by boiling sulphur with lime or potash, precipitating the solution with muriatic acid, and throwing the precipitated sulphur on a filter and washing it. If this form of sulphur were always prepared in this manner, no impurity would exist in it. But it has been observed that this article, in London at least, contains always above one half its weight of impurity. To ascertain if this substance, in Glasgow, was equally impure, 58·85 grains were ignited in a platinum capsule, and were found to lose 29· grains. This would make the composition of the sulphur—sulphur 49·27, and sulphate of lime 50·73. But as the gypsum was in crystals, it obviously contained its water of crystallization, which must, therefore, be calculated. The constituents of hydrous gypsum are—Ca O = 3·5 S O3 = 5 2 H O = 2·25 = 10·75. The quantity of water belonging to the sulphate of lime found in the analysis will therefore be 13·42 per cent. The true constituents then are—

Sulphate of lime	50·73
Water of crystallization	13·42
Sulphur	35·85
	100·

III.—OXIDE OF ZINC.

This oxide generally effervesces on the addition of an acid, proving the presence of carbonate of zinc or of the carbonate with which it has been precipitated. When, to the solution of this oxide in muriatic acid, an excess of caustic ammonia is added, some brownish-red flocks of peroxide of iron remain undissolved, containing, perhaps, a little alumina, amounting to about one-half per cent.

IV.—RED OXIDE OF IRON.

This oxide, as sold in the shops, has been examined by my brother, Mr. James Murdoch, and found to contain a small per centage of alumina.

V.—TARTAR EMETIC.

This salt generally contains a small quantity of peroxide of iron.

Glasgow College, Laboratory,
April, 1844.

Note by Dr. R. D. Thomson.—The first person who published an account of the extraordinary mixture, called calamine in the shops, was Mr. Brett, in the "British Annals of Medicine," vol. i., p. 485. He found, however, traces of lead and zinc in the specimens which he analyzed—a circumstance which has never occurred to me, either before or since that period. It is possible, therefore, that the specimens may vary slightly; sulphate of lead is a probable ingredient, in minute quantities; but I very much doubt if the manufacturer of this article is honest enough to supply his customers with even a trace of zinc. It is not a little remarkable that this adulterated article should have, for so long a period, been infesting every drug-shop, to the utter exclusion, apparently, of the genuine article in England and Scotland, without any complaint from those who purchase it. Does this fact not prove that as calamine is used in the form of ointment, it is the lard which is the efficient application. Mr George Schweitzer, of Brighton, first published an account of the impure smell of sulphur in the "British Annals of Medicine," in 1837, vol. i., p. 618, and showed that the sulphate of lime was introduced by substituting sulphuric acid for muriatic acid in the precipitation of the sulphur from its base. I may mention that this adulteration is easily detected by the microscope, the crystals of sulphate of lime being very apparent. It is not easy to discover any other method of excluding such adulterated articles from commerce, unless by the acquisition of a scientific knowledge of chemistry by the druggists of this country.—*Lancet.*

TOXICOLOGICAL AND CHEMICO-PHARMACEUTICAL EXPERIMENTS ON DIGITALIS.

By M. Bonjean.

Experiments made on dogs and observations collected concerning man, have placed beyond doubt the poisonous action of *Digitalis Purpurea*. Indeed, this substance has constantly caused the death of animals to which a few drachms of it have been administered; and M. Orfila concludes from numerous facts which he has observed on this subject: 1st, that the powder of digitalis, its resinous and aqueous extracts and its tincture, should be regarded as energetic poisons; 2nd, that the resinous extract is endowed with more active poisonous properties than the aqueous extract, and that the powder is less powerful than the latter.

I have, in vain, endeavoured to poison chickens by administering to them powerful doses of the powder of digitalis, which produced, in these animals, none of the ordinary consequences of swallowing this plant.

FIRST EXPERIMENT.

On the 3rd of November, 1842, at 9 o'clock in the morning, I administered to a healthy chicken, which had been kept fasting during the night, two drachms of the powdered leaves of digitalis, formed into boluses by means of a little gum and water; six hours afterwards, the animal not experiencing any appreciable effect, I gave it some seeds, which it ate with appetite. On the 4th, the same state of health as before. On the 5th, at 9 o'clock in the morning, 4 drachms of the same powder were administered, but without producing any remarkable action. The animal ate as usual, and chirped every morning. Its excrements were of the colour of digitalis.

On the 7th, at 9, a.m., I administered to it an ounce of the same powder, and kept it without food until 5, p.m. On the 8th, it often laid down, and ate little; but on the 9th, it resumed its ordinary appetite and vivacity, and continued thus until the 12th, when it was killed to be eaten. Its flesh had not any particularly bad taste.

This chicken had taken, in four days, 14 drachms of the powder of digitalis which had been gathered two years. According to the opinion, generally admitted in medicine, the age of this plant would be the principal cause of its inertness; we shall see that recently gathered digitalis does not possess a more energetic poisonous action, at least on chickens.

SECOND EXPERIMENT.

On the 25th November, 1842, at 8, a.m., I administered to a healthy chicken, which had fasted since the previous evening, 4 drachms of powdered leaves of digitalis, of that year's crop. On the 26th, morning and evening, I administered each time, an equal quantity of the same powder. On the 27th, the animal had hitherto had no food, except the 12 drachms of the powder, and experienced no symptom except a little weakness. At noon it ate with appetite, and, by the next day, it recovered its former state of health.

On the 8th and 9th December following, for its entire nourishment, an ounce and a half of the same powder of digitalis was given to it, at three different times. The powder was formed into boluses, which formed a very great bulk, and seemed to be with difficulty digested by the animal. On the evening of the 9th, it appeared ill; its stomach was considerably swelled, as if it had eaten too much. On the morning of the 10th, I found it dead in its cage; a bluish liquid was flowing from its beak.

Autopsy made at 12, p.m., *by Dr. Chevallay.*—The œsophagus was lined with brownish matters. The stomach was distended by an enormous quantity of the swallowed substance, and its membranes were like parchment. The internal membrane was red, without presenting, however, evident traces of inflammation. The pericardium contained little serosity. The two auricles, as well as the large veins which surround the heart, were filled with blackish blood, as also was the right ventricle of the heart. The lungs were in the healthy state, but a little congested. The liver was in the normal state, only the gall bladder was filled with bile. The veins of the mesentery were full of blackish blood: however, the intestines did not present any signs of phlogosis. The matters found in them were of the same colour as those contained in the stomach, but this colour was less apparent. The gullet also contained the same matter, with pieces of straw and some grains of stone; it did not present anything peculiar. The spinal marrow exhibited no lesion. The cerebral substance was rather congested, and reddish.

THIRD EXPERIMENT.

From the 24th December, 1842, to the 9th January following, I administered every day to a healthy chicken, two drachms of powdered leaves of digitalis of the last crop; in 17 days, this animal took four ounces and a quarter of this powder, which produced in it no appreciable action. During these 17 days it ate as usual, and I used it for the following experiment:—

FOURTH EXPERIMENT.

Two ounces of the powder of recent digitalis were exhausted by alcohol at 33°, by displacement. The solution, which was of a fine green, was distilled in order to remove the greater part of the alcohol, and the residue concentrated to a syrupy consistence, was precipitated by water in order to separate from it the resin. (See Experiment 5). The filtered liquid was then of a deep dull green, and very bitter. Evaporated to the consistence of a soft extract, this new residue was formed into boluses with a little gum; then administered on the 10th of January, 1843, at 9, a.m., to the chicken which had been the subject of the foregoing experiment. This dose of extract, which contained all the bitter portion and extractive matter of two ounces of digitalis, produced in this animal no morbid symptoms.

FIFTH EXPERIMENT.

On the 11th of January, 1843, at 8, a.m., I administered to the chicken of the two foregoing experiments all the portion precipitated by water from the concentration of the alcholic treatment of two ounces of powdered digitalis. (See Experiment 4). The product was a mixture of chlorophylle and resin. The animal was not incommoded by it; it continued to enjoy its usual health.

SIXTH EXPERIMENT.

It remained to ascertain whether the flower of digitalis was as offensive as the leaves. For this purpose, from the 13th to the 15th of December, 1842, I administered to a very robust chicken two and a half ounces of powdered flowers of digitalis, taken at four different times, in half ounce doses. On the 16th, at 4, p.m., the animal being in good health, I gave it four drachms of powdered leaves of the same plant. On the 17th, it was rather weak, without any other apparent symptom; it had, however, taken, in four days, for its entire nourishment, only four ounces of the powdered flowers and leaves of digitalis. At noon, some grain was given to it, which it ate with appetite, and it continued from that time to enjoy its former state of health.

CONCLUSION.

From the preceding experiments it results, that *digitalis purpurea* does not produce any injurious effect on chickens, to which very large doses of it have been administered, either in powder, or under the form of aqueous or resinous extract. The flower of digitalis does not possess, as a poison, and in the same animals, any more apparent action than the leaf. The death of the chicken of the second experiment is attributable only to indigestion, which very well explains the kind of congestion which was remarked in the autopsy. These results are surprising, when it is considered that six drachms of powdered digitalis are sufficient to cause, in the space of twelve or fifteen hours, the death of a healthy dog of the ordinary size (Orfila, *Traité des Poisons*, 3rd edit, t. ii., p. 285): whilst an ounce-and-a-half or two ounces, administered to chickens in twenty-four hours, do not produce in these animals any morbid phenomenon. The chicken which served for the third experiment took, in seventeen consecutive days, four ounces of powdered digitalis, without being incommoded by it. Can the very nature of the digitalis employed in my experiments be objected to as the cause of this inertness, when physicians daily prove, in my establishment, the efficacy of the same plant as a therapeutic agent? I have had an opportunity of meeting with a fact of this kind in the numerous experiments which I have made on different animals with ergot of rye. Sometimes the oil extracted from this substance immediately acted in the dose of a drachm in chickens, which were thus narcotised in four or five minutes, and died in the space of a few hours; while the same oil, extracted from the same powder, and arising from the same experiment, did not produce in these animals any appreciable effect, even in a dose of two, three, or four drachms. In the latter case, the poison confined itself to producing a simple local irritation, and completely passed off, without being absorbed, in the stools, where the oil was found an hour and a half or two hours after having been swallowed. M. Gasparin has lately announced to the Academy of Sciences of Paris, that arsenious acid was not a poison for sheep affected with pleurisy: I now announce a fact, if not as important in its consequences, at least as curious, viz.: that digitalis, which is a poison to man and dogs, does not exert on healthy chickens any sensible action.

RESULTS OF SOME CHEMICO-PHARMACEUTICAL EXPERIMENTS ON THE SAME PLANT.

When the powder of the leaves of digitalis is heated by water and by displacement, a very bitter solution is obtained, which contains almost the whole of the active principles of this plant. By suitably acidulating the solution with sulphuric acid, a green resin is separated from it, in which the diuretic properties of digitalis appear to reside. This resin is insoluble in ether, soluble in aqueous alcohol, and the alcoholic solution may be mixed in all proportions with water, without the resin being precipitated, although water does not dissolve it.

The powder of digitalis, exhausted by water, afterwards yields to alcohol all the chlorophylle mixed with a new portion of resin, which appears to be of the same nature as that which sulphuric acid precipitates from the aqueous solution of this powder. After this double treatment, the digitalis is reduced by about half its weight. The powder, exhausted by water and alcohol, contains only very little green coloring matter, or chlorophylle, which may easily be isolated by means of sulphuric ether.

One ounce of powder of digitalis furnishes about 18 or 20 grains of green resin, and 14 or 15 grains of chlorophylle. It is to this latter substance that the tincture of digitalis of the shops owes its beautiful blue colour. It is easy to see, from that, that this colour should have no influence on the property of the medicine, and that the tincture will be so much the more rich in green colouring matter as the alcohol employed in its preparation contains less water.

To be efficacious, as much as it can be at least, tincture of digitalis should be prepared with alcohol at 20 or 22 degrees, and not with alcohol at 91 degrees, as recommended by all authors. I regard the aqueous extract as the most certain and energetic of all the preparations of this plant.

The ether which is caused to act directly on the powder of digitalis, extracts from it all the chlorophylle, and extracts from it only that; a tinture of a superb green is thus obtained, but entirely deprived of medical properties, contrary to the opinion of MM. Le Royer of Geneva, Planavia, and others, who regard ether as the best solvent of the active principle of digitalis.

For my part I am convinced that the ethereal tincture of digitalis possesses no other properties than those which belong to ether itself.—*Journal di Pharmacie*, and *Chemist*.

INTRODUCTION OF THE COCHINEAL INTO ALGIERS.

DESCRIPTION, EDUCATION, AND PROPAGATION OF THE INSECT.

By M. SIMOUNET, Pharmacien, of Algiers.

(From the Pharmaceutical Journal.)

France pays yearly to strangers a tribute of nine or ten millions (of francs) for the cochineal which she uses. Struck with this important consideration, M. Simounet wished to turn to profitable account, as regards the national interest, the knowledge which a year's residence in the neighbourhood of Valence, in Spain, had enabled him to acquire, with reference to the education and propagation of the cochineal. He thought it would be rendering a great service to France if this valuable insect were introduced into her African possessions, where it ought to thrive, in a climate quite similar to that of the south of Spain. In defiance, therefore, of the severity of the Spanish law, which awards the punishment of death for exporting the cochineal insect, he quitted Valence, provided with all that was necessary for the execution of his project.

His first attempts were unsuccessful; but by perseverance he succeeded in overcoming all difficulties, and in 1840 he obtained 500 grammes of cochineal of the best quality.

At his instigation, several agriculturists of Algiers engaged in the cultivation of the insect, and a model cochineal plantation *(nopalerie)* was established in the experimental garden at Algiers, through the exertions of M. Hardy, its director.

The government seemed to take an interest in these praiseworthy attempts, and, thanks to the zeal and enlightened devotion of M. Simounet, the possibility of naturalizing the cochineal in Algiers is no longer a problem.

We have extracted the following details from a communication received from M. Simounet, in which he has carefully described the physical characters of the male and female cochineal, and pointed out the course to be pursued in their education and propagation. We gladly avail ourselves of the curious facts thus communicated, and which are entitled to the greater confidence, as they are mostly the result of his own immediate observation.

DESCRIPTION OF THE COCHINEAL.

1. *Physical Characters of the Male Insect.*—The male cochineal differs entirely from the female. It is a dipterous insect, having two transparent wings; six feet, each terminated by a small, very sharp claw; two antennæ, composed of nine articulations, covered with a silky down, and six black and immoveable eyes. Its red body is covered with a white dust, its abdomen is terminated by two white silky hairs. The length from the head to the extremity of the abdomen is one millimetre; the size is that of an oblong louse.

The period of maturity of the male cochineal is not the same as that of the female. Like the latter, he fixes himself on the cactus, but his body is not equally developed. Instead of enlarging, he becomes covered with down, at the expense of which down, after the lapse of a month and a half, a cocoon is formed. The two hairs which issue from his posterior extremity serve to keep the cocoon always open. At the fecundating period, a month and a half after his birth, he issues backwards from his envelope, and flies from one female to another; afterwards he dies and disappears.

2. *Physical Characters of the Female Cochineal.*—The female cochineal presents the aspect of an elliptical pea. Its body is composed of an indeterminate number of rings, giving it the appearance of a curled-up annilede. Its colour is blackish.

The body is covered with a white pulverulent down, which, being impermeable by water, serves as a defence against the inclemency of the seasons.

The feet are six in number, having two articulations, and each terminated by a pointed claw.

There are two cylindrical antennæ, composed of three articulations, of which the last is rather the longest.

Between the two upper feet are situated the organs of nutrition. These organs are composed of a small gland, and a canal of the diameter of a hair, and of a red colour, showing that the plant on which it feeds is introduced into the cellular system.

Some naturalists have stated that the cochineal is born after the death of the mother, that the body of the latter serves as an envelope for a multitude of eggs, which after her death begin to hatch. The fact is quite otherwise. The cochineal is really viviparous, and survives the production of its little family. The number brought forth, according to my observations, is not 632,777, as stated by a Spanish author, but about 300.

The female cochineal is that to which we shall direct especial attention here, as she alone forms the article of commerce, and the substance so much prized for its colouring properties. It is from the female insect that carmine and the different lakes are prepared. She certainly affords one of the most valuable colours employed in the art of dyeing. On this account the insect merits a greater degree of attention than has hitherto been devoted to it.

EDUCATION AND PROPAGATION OF THE COCHINEAL.

I. *Choice of the Cactus.*—The cochineal does not thrive well, excepting on the cactus cochinillifera, and there are several reasons for this.

In the first place, the hairy surface of this plant facilitates the peregrinations of the young insects. If there should happen to be much wind, not only do the feet of the insect catch in these small hairs, but the two surfaces adhere at a number of points, and its position is thus retained. It has been proved that the cacti of Africa may be employed for the propagation of cochineal, but less advantageously than the other, as the least wind dislodges the insect. Moreover, the cactus cochinillifera produces a fruit which has always a purple colour; and, according to Pelletier's analysis, this plant contains the colouring matter of carmine, and of the insect which affords this valuable product.

2. *Arrangements of a Nopalery, or Cactus Plantation.*—In establishing a *nopalery*, it is desirable to select a spot of ground sheltered, as much as possible, from the north winds; the ground should be laid out in furrows, and well freed from weeds.

Slips of the cactus having been procured, they should be exposed to the air for a few days, so that the part at which they have been cut may become dry. The season best adapted for making the plantation is summer.

The slips should be planted in rows, at a distance of thirty-nine inches from each other; the rows should be two yards apart, for convenience in collecting the cochineal. The plants should be watered every fifteen days in summer. The ground should be turned up once a year with the mattock or plough. The fruit of the plants should be taken off as it appears, so that the plants themselves may retain the properties, of which they would otherwise be exhausted by the fruit. The plants should not be allowed to grow more than about sixty inches in height, the branches being spread out in the form of a fan.

The plants, having attained the proper growth, may now be employed for the propagation of the cochineal.

3. *Method of placing the Cochineal on the Cactus.*—In Spain they prepare for this purpose small cylindrical cases, about two inches long, and about

two-thirds of an inch in diameter, open at one end. A palm leaf is used for making these cases, the net-work of the leaf allowing a sufficient opening for the insect to pass through. These cases are intended to contain a dozen of the female insects; fifty such cases are attached to a cactus by means of small thorns obtained from the cactus ferox; metallic points for fixing them must be avoided, as the wounds occasioned by them would injure the plants.

The period at which the cochineal is about to produce its young is known from the appearance of a small drop of a coloured substance at the posterior part of the insect. This is also the period for the collection of the insect.

4. *Method of collecting the Cochineal.*—In the first place, by means of a knife made of reed, the insects intended for reproduction must be carefully detached, and placed in the small cases already described, ready to be fixed on the plants after they have been properly washed and brushed. This first operation being concluded, cloths are to be spread on the ground under the plants, and, with a brush made from the palm, all the insects which remain are brushed off; this constitutes the available product. Three gatherings may be made in the year; in May, July, and October. After each collection it is very important to clean the plants with brushes, and even to wash them, so as to remove all the white matter deposited by the previous crop of cochineal. With careful attention to these directions, the plants may be made to serve for the propagation of the insect for five or six years.

5. *Method of killing the Cochineal.*—Several methods have been adopted for killing the insect. In Spain boiling water is used; mere exposure to the sun has been recommended, also the placing the insects on plates in an oven. But all these methods are imperfect, as they sensibly alter the quality of the colouring matter.

I recommend the following method, as being, under all circumstances, the best and most convenient:—It consists in exposing the insects to the heat of a water-bath, and drying them at a high temperature without exposure to light. The quality of the cochineal obtained in this way was equal to that most esteemed in commerce.

Enemies to the Cochineal.—The enemies to the cochineal are—first, a small snail which fixes itself on the cactus, and which is easily removed on examining the plants every eight days. Another of these enemies is the *coccinelle* (lady cow), called by the Spaniards *pintillos*. This insect produces great ravages. The means for effecting its destruction occasions the greatest amount of trouble connected with a *nopalery*. The eggs which produce the larvæ of this insect (and it is in the state of larvæ that it is so destructive to the cochineal), are generally found at the base of the cactus.

There is another insect which I have only observed in Africa, and which requires to be especially guarded against; it is the *forbicina*. These get into the little cases in which the female cochineal, intended to stock the plants, are placed, and they devour the cochineal. This evil may be obviated by closing the openings to the cases with muslin after introducing the cochineal.

It will be evident from the foregoing that the well-being of a *nopalery* will depend upon the exercise of much attention and vigilance.—*Journ. de Pharm.*

Taffeta et Charta Vesicatoria Adhæsiva —At the third meeting of the Scandinavian Naturalists, at Stockholm, Mr. Assessor Pripp communicated the following formula for a cheap blistering taffeta, which adheres well to the skin:—Take four parts of common frankincense (*resina abietis, or thus*), dissolve, by a gentle heat, in six parts of oil of turpentine, and then digest therewith three parts of powdered cantharides. After expressing and straining the cantharides balsam from the residue, spread it on the strained taffeta, which has been previously prepared on the opposite side with isinglass gelatine, to prevent the transudation of the balsam. In the same way may be prepared a blistering paper, which is cheaper than the blistering taffeta.—*Buchner's Repertorium.*

ON THE DIGESTION OF THE HERBIVORA

By MM. Prevost and Morin.

[Concluded from page 23.]

OF THE LIQUID PORTION OF THE MASTICATED MASS.

The contents of the stomach of a large rabbit furnished, by pressure, 95 grammes of very acid liquor, which was filtered with difficulty, and in which was deposited a white pulverulent substance, in great measure due to silica, and doubtless arising from the vegetable matter, disaggregated by the gastric juice. This liquor became clear by repose, and produced no coagulum, even at the end of two days. No change was manifested by the addition of hydrochloric acid or potassa; by saturating the acid by ammonia, and by boiling it, a large proportion of albumen was separated, after filtration; alcohol precipitated from it a substance soluble in water, forming with tannic acid a combination soluble by means of heat, and not by cold, and possessing the other characters of gelatiniform matter.

Two grammes of the liquid of the stomach, evaporated at a moderate heat, furnished 0gr. 07 of solid substances, soluble in water, composed in great part of the two substances which we have just mentioned, and of a small quantity of alkaline chloride, or other salts.

OF THE NATURE OF THE ACID OF THE MASTICATED MASS.

We divided the expressed and filtered juice of the masticated mass of a rabbit into two equal parts. One was immediately precipitated by nitrate of silver, after the addition of nitric acid; it required 0gr. 11 of nitrate. The other was evaporated and dried in an oil bath carried to 300° F. The residue re-dissolved in distilled water, and nitric acid being added to it, required only 0gr. 89 of nitrate of silver for its precipitation. The chlorine was, therefore, approximatively—

For $\frac{3}{4}$ under the form of fixed chlorides.

For $\frac{1}{4}$ in the state of free hydrochloric acid, containing traces of ammoniacal salt.

Another portion of the liquid of the masticated mass was boiled in an oil-bath at 284° F., and the product of the distillation received into a flask, contained a solution of acid nitrate of silver. From the first drop of the product there was a precipitate of chloride of silver, whose proportion went on increasing until the end of the operation, the temperature of the oil-bath rising to 356° F. The dry matter contained much alkaline chlorides.

The presence of free hydrochloric acid in the stomach of herbivorous animals, independently of the acids proper to vegetable matters, appears to us a fact so well established by other observers, and among others by the work of one of us, made in connexion with M. Le Royer, that we did not stop at this point; but Dr. Thomson, having recently disputed the presence of free hydrochloric acid in the stomach, we mention these experiments which confirm the received ideas on the subject.

OF THE PELLICLES WHICH COVER THE MASTICATED MASS.

The pellicles of the masticated mass, separated and washed, became glairy in water heated to 140° F. However, nothing was dissolved. It was the same in elevating the temperature to 212° F. The filtered liquor was not precipitated by spirit of wine, tannin, acetic acid, nor by hydrochloric acid. A few drops of very dilute caustic potassa operated the solution of this matter, especially with the aid of heat. The liquor was then susceptible of being separated by the acids. The pellicles consisted, therefore, of coagulated albumen, whose solution in water could only be effected by the intermedium of a base.

Besides these pellicles, we have frequently observed, against the sides of the stomach, white membranous substances of the same appearance as the pellicles, and which we detached from them with the greatest facility. A deposit of this nature was extracted from the stomach of rabbits, opened twenty-four hours after death, and freed from the masticated mass.

Treated by cold water, this membranous deposit rendered it acid. It dissolved neither with cold nor heat. However, the liquor was rendered slightly turbid by the hydrochloric and acetic acids, especially with heat. Tannin produced in it a coagulum soluble to a great extent by heat, and re-appearing by cooling. The matter applied against the sides of the stomach was, therefore, formed of coagulated albumen, impregnated with traces of uncoagulated albumen, of free acid, and of a small quantity of gelatiniform matter. It was identical with the pellicles which enveloped the globules of the masticated mass.

The clear manner in which the separation of albumen was operated in the stomach of the rabbits, either at the surface of the globules, or against the sides of that organ, appears to us to give great weight to the hypothesis which had directed us in our experiments on the sheep. Here we found the albuminous matter pure, isolated, and ready to be passed into the small intestine. However, if the partial deposit on the surface of the globules was uniformly presented, it was not the same with the voluminous deposit on the surface of the stomach. In most cases it was completely wanting, whatever care we might take to prevent the animal being disturbed in its digestion, although we varied the time between alimentation and death. Indeed, we remarked that we regularly found the albuminous plates only when the animal had been killed a long time. It then became less probable that this separation of albumen was due to vital action. To elucidate this question, we opened the stomach of a rabbit immediately after it was killed, and after having ascertained that there was no albuminous deposit, other than that of the globules, we replaced it, after having closed it by a suture. On examining it twenty-four hours later we found a deposit of albumen resembling a false membrane, completely enveloping the masticated mass, and lining all the sides of the stomach. This experiment was decisive. *The chyme is not precipitated from the masticated mass during the act of digestion.*

However, an albuminous membrane is formed on the surface of the globules even during this act. After death, the albumen is deposited against the sides of the stomach, and is coagulated. This operation is slowly performed during and after the cooling of the body.

ON THE MATTER PRECIPITABLE BY TANNIN, AND SOLUBLE BY HEAT.

It was this substance that we found in the liquid of the cotyledons of the cow, and to which we have provisionally given the name of gelatiniform matter, although it does not crystallise, but especially because it is insoluble in alcohol, and because it produces, with tannin, a precipitate soluble by heat. We found it in the liquid part of the contents of the fourth stomach of the sheep and in the stomach of rabbits.

We also extracted a matter endowed with similar properties from the serum of blood of sheep, and from that of a pregnant woman, precipitating by alcohol the serum completely freed from albumen. One of us found, some years ago, a similar substance in the urine of a diabetic child, and in two healthy urines, but in very small proportions in these last.

Recently, also, a tumor of the knee, examined by M. Calloud, contained a considerable proportion of the same substance.

Finally, MM. Tiedemann and Gmelin have remarked, in a single case, it is true, a substance which appears identical with the gelatiniform matter. They say (first volume of the French translation of their memoir, p. 203), on the occasion of the examination of the contents of the digestive tube of a dog fed with boiled starch, that after having treated the liquors of the stomach, small intestine, and cœcum, by alcohol, to remove the sugar, "the residues were treated by hot water. That of the stomach gave a brown extractive mass, susceptible of being drawn out in very fine threads, like thick mucilage. In burning, it gave out the odour of toasted bread. Its solution in water gave rise, with the tincture of galls, to an abundant precipitate, which disappeared every time the liquor was heated, and re-appeared as soon as it was cold. This solution

also abundantly precipitated the neutral acetate of lead, and the protonitrate of mercury. It did not act on iodine, nor on the protochloride of iron."

They regarded this substance as a modification of starch, operated in the act of digestion.*

After having detected the presence of matter possessing constant properties in the cotyledons, in the blood, and the contents of the stomachs of herbivorous animals, we were led to seek for them in the plants which serve them for food.

We shall say nothing concerning albumen, whose presence in the juice of plants is generally recognised. After having eliminated this substance, by the ebullition of the expressed juice of the vegetables composing the ordinary provender, and, after having filtered it, the liquid was evaporated to a syrupy consistence, then mixed with concentrated alcohol. A precipitate was formed, which, when dried, did not attract moisture. It was brownish, had no distinct taste, and possessed the following properties:—

It was insoluble in alcohol, and in ether, cold and hot. It was completely dissolved in cold water. This solution precipitated the nitrate of silver, and the coagulum disappeared by the addition of nitric acid. It also precipitated the basic, neutral, and acid acetates of lead. The coagulum which it formed with tannin was dissolved by a heat of 140° F., and re-appeared by cooling. The yellow and red cyanurets of potassium and iron, the chloride of platinum, and the mineral acids, had no apparent action on this solution. It was the same with liquid chlorine, sulphate of copper, perchloride of mercury, alum, and persulphate of iron.

With the exception of the absence of action on these latter re-agents, all the other characters correspond to those of the gelatiniform matter. On the occasion of the examination of the liquid of the cotyledons of the cow, we remarked that the gelatiniform matter contained a small quantity of caseum. As proteïn, in the state of albumen or caseum, possesses the property of precipitating sulphate of copper, persulphate of iron, alum, perchloride of mercury or liquid chlorine, it may be believed that the extractive matter of the provender exerted no action on these re-agents, because no caseum at all is found in it, and because it is from the juice of these vegetables that the pure gelatiniform substance may be extracted.

The matter extracted from the juice of that plant is nitrogenous, for it burns with the odour of animal substances. By distillation it furnishes an empyreumatic oil, ammoniacal water, and a gas which forms a black precipitate in a solution of protonitrate of mercury.

We have ascertained that a substance possessing the same properties is met with in the juice of a great number of plants, which are not used as food for herbivorous animals.

The facts detailed in this memoir have taught us, relative to the nutrition of herbivorous animals:—

That we find, in the masticated mass of the sheep and of the rabbit, a nitrogenous substance similar to that whose presence we have noticed in the liquid of the cotyledons of the cow:

That this substance is met with in the blood of the sheep, as well as in that of man and human urine:

That it exists ready formed in the juice of all vegetables, some of which are used while others are not, for the alimentation of herbivorous animals:

That there is a partial coagulation of the albumen of the nutritive matters on the surface of the globules contained in living rabbits:

That the greatest part of the masticated mass of the rabbit is not coagulated during the act of digestion, and is precipitated only after death:

That, likewise, there is no coagulation of albumen in the fourth stomach of sheep during life, but that some is deposited after death against the sides of that organ:

The presence of uncoagulated albumen, and of the gelatiniform matter in the crude aliments, and in most of the animal fluids, admits of our regarding these two substances as performing a part of the first importance in the digestion of the herbivora, and of believing that this act has for its principal objects the extraction and absorption, without change, of these two substances.

In an early memoir we will return to the actions which the acid and the alkali exert during the act of digestion.—*Chemist.*

* MM. Prévost, and Le Royer also obtained from the liquid extracted from the first and second stomachs another substance, having the property of gelatine.—*Bibl. Univers*, t. 27, p. 231.

ON THE ORIGIN OF SULPHUR IN VEGETABLES.

By M. Huraut.

(From the Chemist.)

Besides carbon, hydrogen, oxygen, and nitrogen, which are considered as the only truly organic elements of vegetables, several plants, and especially those which belong to the family of cruciferæ, also contain sulphur as a constituent principle. Although this fact, which is in a high degree interesting to physiology, has long been known, the works which have of late years been published concerning this part of natural history have made no mention of it. This omission is so much the more to be regretted, as in these works, otherwise so remarkable, the highest questions of natural philosophy are treated in a quite new point of view, according to which the organizable elementary principles of vegetables perform in it the most important part.

It is only quite lately that Dr. Vogel, senior, of Munich, called attention to this subject by publishing the experiments which he made on one of the plants, the *Lepidium sativum*, which contains the most sulphur.

Until then the origin of this simple body in plants was explained by admitting that the soil in which they were developed contained either free sulphur (which is the case only in volcanic soils), which they directly assimilated, or sulphates, which, after their absorption, were decomposed, under the influence of the organism, in such a manner that sulphur, which they appropriated to themselves, resulted. But this hypothesis, which may not be impossible when plants which are strongly disposed, like the cruciferæ, to assimilate sulphur, are found in a soil which contains that substance in the state of freedom or combination, becomes insufficient since the investigations of Dr. Vogel.

It results, indeed, from the investigation of this learned physiologist, that young plants of *Lepidium sativum*, which had germinated in a soil formed solely of quartz and finkglass, reduced to a coarse powder, of ground glass, calcined and washed with boiling water, or even also of silica, arising from the decomposition of fluosilicic gas by water, and consequently free from sulphur and sulphates, contained fifteen times more sulphur than a weight of seeds equal to that which had served for their production.

M. Vogel has endeavoured to account for the great quantities of sulphur existing in the plantules of *Lepidium*, which he had submitted to analysis; but as their growth was operated not only in a soil which contained neither sulphur nor sulphates, but also in a room sheltered from all contact with sulphurous vapours, this fact is an enigma of which, for, the moment, he was unable to give a satisfactory explanation.

Among the precautions taken by M. Vogel to avoid, in his experiments, the presence of any sulphurous vapours whatever, there is an important and, in our opinion, an essential one, which he has totally forgotten, that of depriving the air, in which his seeds of Lepidium were developed, of sulphuretted hydrogen, and which, like carbonic acid, ammonia, and protocarburetted hydrogen, forms a constituent part of the atmosphere.*

* Hitherto the presence of protocarburetted hydrogen (marsh gas) in the air has not been directly demonstrated; it is only by induction that M. Boussingault has been led to admit this gas among the constituent principles of the atmosphere. I thought it right to act in the same manner with regard to sulphuretted hydrogen, because the considerations adduced in favour of the existence of this body in the air appear to me at least as plausible as, if not more so than, the consequences which have served to prove that of marsh gas.

In support of this assertion, I will briefly recapitulate the principal circumstances in which sulphuretted hydrogen is produced, as well as some of the phenomena to which its presence in the atmosphere gives rise.

Sulphuretted hydrogen gas is constantly, and sometimes in considerable quantity, disengaged from the mineral waters called sulphurous; it is one of the products of the putrefaction of vegetable and animal substances, as also of the decomposition which certain metallic sulphates undergo in contact with water, and easily oxygenizable organic matters.

The grey tint, then black, which all oil paintings acquire in the air; the alteration which the metals, such as gold, silver, and copper, undergo in contact with this same agent, either in their colour or in their texture;* the brown coloration and afterwards the black precipitate caused in the solution of a salt of lead, for a long time traversed by a current of air, are phenomena due to the sulphuretted hydrogen contained in the air.

The presence of this gas in the atmosphere being once admitted—and I think it cannot be disputed—nothing is more easy than to explain the origin of sulphur in vegetables; sulphuretted hydrogen, the same as carbonic acid and ammonia, is absorbed by the plants, then, under the influence of the forces which preside over vegetative life, decomposed into these elements, which are assimilated or rejected according to necessity. According to that, sulphuretted hydrogen becomes a gas as essential to the life of certain beings of the vegetable kingdom (and perhaps of all, if, as some chemists admit, sulphur be one of the constituent principles of albumen) as, carbonic acid and ammonia are to the existence of all.

The investigations of Dr. Vogel are of high importance to physiology, not only because they confirm the experiments of the chemists who, before him, announced the presence of sulphur in vegetables—this fact had been observed too often to be doubted—but indeed because, quite indicating the true source from which all plants derive the sulphur of which they have need, they furnish a new proof in favour of those very simple and admirable laws which, according to certain physiologists, govern organic matter. It is thus, for example, that it will always be possible for us to apply to one of the phenomena of life, the beautiful idea of M. Dumas, so true in its principles: "That which animals give to the air, vegetables take from it, so that, to take these facts in the highest point of view of terrestrial physics, it must be said that, as regards their truly organic elements, the plants the animals derive from the air are only condensed air."

The existence of sulphuretted hydrogen in the atmosphere, it appears to me, should also lead to the explanation of a phenomenon which has already several times fixed the attention of philosophers; I allude to the sulphurous odour always manifested where lightning flashes. It may be conceived that, when an electric spark passes through the air, sulphuretted hydrogen, which is formed in its passage, is decomposed into its elements, which, on account of the high temperature to which they are exposed, combine with the oxygen of the air, forming water and sulphurous acid. It is this acid that produces the sometimes

* Gold, silver, and especially copper, when long exposed to the air, undergo an evident alteration, due to the formation of a sulphuret of these metals. Thus gold is tarnished, and takes a colour more and more brown; silver becomes yellow at first, then brown, and afterwards black; it is the same with copper, whose alteration is much more prompt and more evident. A remarkable instance of this kind of alteration is recorded. The point, which was entirely formed of copper, of the arrow of a lightning conductor surmounting one of the edifices of Paris, was found completely converted into sulphuret of copper.

very penetrating odour of burning sulphur which is remarked after each explosion. I now confine myself to this single indication; I shall hereafter return to this subject to give it all suitable development.

NEW FORMULÆ.

(From Neligan's New Work on Medicines, their Uses, &c.)

ANTACIDS.—Aquæ Ammoniæ, min. x.; Infusi Chirettæ, f℥i.; Tincturæ Aurantii, f℥ij. M. Fiat haustus, mane meridieque sumendus. (A useful antacid draught in the dyspepsia of the debilitated, attended with acid eructations.)

Ammoniæ Bicarbonatis, gr. viij.; Infusi Calumbæ, f℥i.; Tincturæ Humuli, f℥i.; Tincturæ Hyoscyami, min. xx. M. Fiat haustus, bis quotidie sumendus. (Less stimulating than the former, and better adapted for cases in which the stomach is irritable.

Ammoniæ Carbonatis, gr. xxiv.; Fellis Bovini Inspissati, ℥ss.; Mucilaginis, q. s. M. Fiant pilulæ duodecim; Capiat unam ter in die. (In dyspepsia accompanied with vomiting of food and constipation.)

Aquæ Ammoniæ Carbonatis, f℥ss.; Infusi Cascarillæ, f℥vij.; Spiritus Ætherei Nitrosi, f℥i.; Spiritus Cinnamomi, f℥iij. M.; Fiat mistura, de quâ sumantur cochlearia ij. ampla ter in die. (In the lithic acid diathesis, with debility of the digestive organs.)

Aquæ Calcis, f℥iv.; Confectionis Aromaticæ, ℥ij.; Tere simul et gradatim adde, Misturæ Amygdalarum, f℥iiiss.; Aquæ Lauro-cerasi, f℥i. M.; Fiat mistura; Capiat cochlearia ij ampla bis terve in die, phialâ priùs concussâ. (Useful in cardialgia and in gastrodynia.)

Misturæ Cretæ, f℥vi.; Tincturæ Humuli, f℥i.; Tincturæ Cardamomi, f℥vij.; Vini Opii, f℥i. M. Capiat semiunciam sextis horis. (In diarrhœa dependant on acidity of the *primæ viæ*.)

Pulveris Cretæ compositi, gr. xviij.; Carbonatis Sodæ siccati, gr. vj.; Pulveris Tragacanthæ, gr. xij. M. Divide in partes sex æquales, quarum capiat unam quâque secundâ vel tertiâ horâ. (In the diarrhœa of children.)

Aquæ Magnesiæ Bicarbonatis, f℥ss.; Spiritus Lavandulæ compositi, f℥ij. M. Fiat haustus, sumat statim et repetatur semihorio si opus sit. (An excellent remedy in heart-burn.)

Solutionis Alkalinæ *(Brandish)*, f℥v.; Infusi Chirettæ, f℥viij.; Spiritus Anisi compositi, f℥iij.; Syrupi Aurantii, f℥i. M. Fiat mistura; Capiat cochlearia ij. magna ter in die. (In the lithic acid diathesis.)

Sodæ Bicarbonatis, gr. x.; Infusi Anthemidis, f℥iss.; Aquæ Lauro-cerasi, f℥ss.; Creasoti, min. j. M. Fiat haustus sextis horis sumendus, et ad tertiam vel quartam vicem repetendus si opus sit. (In acidity of the stomach, with vomiting.)

Sodæ Carbonatis siccati, ℥ss.; Pulveris Myrrhæ, gr. xviij. Pulveris Ipecacuanhæ, gr. iij. M. Divide in chartulas, vj., quarum unam sumat quartâ quâque horâ. (An excellent antacid in chronic diarrhœa and dysentery.)

ANTHELMINTICS.—Syrupi Allii sativi, (page 15), f℥i.; Olei Terebinthinæ, f℥ss.; Decocti Hordei, f℥vij. M. Fiat enema, injiciatur statim, et horæ unius spatio adhibeatur enema catharticum. (For ascarides in the rectum; half or a fourth part of the above may be used for children.)

Artemisiæ Santonicæ, gr. xxx.; Calomelanos, gr. vj.; Muriatis Sodæ, gr. xij.; Syrupi Jalapæ (page 76), f℥ij. M. Divide in bolos, ij.; Sumat unum manè, et alterum post horas sex, nisi priùs benè dejecerit alvus. (In cases of lumbrici or ascarides.)

Decocti Geoffroyæ, f℥j.; Infusi Gigartinæ (page 17), f℥iss; Tincturæ Valerianæ; Syrupi Zingiberis, a a, f℥ij. M. Fiat mistura, Capiat partem tertiam trihorio. (For expelling lumbrici)

Olei Filicis-maris (page 18), min. xxx.; Misturæ Amygdalarum, f℥ij. M. Fiat emulsio, et divide in partes æquales ij., quarum sumatur una horâ somni, et altera manè sequente. (A most efficacious anthelmintic for the *tape worm*. If it do not purge, an active cathartic should be given in four hours after the second dose.)

Granati radicis corticis, ℥iij.; Pulveris Sabadillæ, gr. vj.; Pulveris Aromatici, ℥ss. M. Divide in pulveres sex, Capiat unum omni semihorâ ad sextam vicem. (In cases of tænia; the last dose should be followed by an active saline purge.)

Pulveris Spigeliæ, gr. x.; Pulveris Stanni, ℥ij.; Syrupi Zingiberis, f℥ss.; Mellis. q. s. M. Fiat Bolus, horâ ante jentaculum sumendus, et per dies tres repetendus, postea adhibeatur mistura purgans ad plenam alvi solutionem. (In cases of lumbrici.)

ANTISPASMODICS.—Tincturæ Fuliginis, f℥ss.; Mistura Camphoræ cum Magnesiâ, f℥vj.; Syrupi Aurantii, f℥iss. M. Fiat mistura, Capiat unciam omni horâ donec abierit spasmus. (In the hysteria of females.)

Spiritus Fuliginis, f℥ss.; Aquæ Sodæ carbonatis, f℥ij.; Syrupi Aurantii, f℥iss.; Aquæ Menthæ pulegii, f℥iss. M. Fiat mistura, sumat cochleare medium tertiis vel quartis horis. (In the advanced stages of hooping-cough in children; a tea-spoonful for infants.)

Ætheris Assafœtidæ (page 24), min. xx.; Spiritus Ammoniæ aromatici, f℥ss.; Misturæ Moschi, f℥j. M. Fiat haustus. (A useful antispasmodic in hysteria and spasmodic colic.)

Tincturæ Castorei compositæ, f℥v.; Ætheris, Sulphurici, f℥iij.; Misturæ Moschi, f℥vij. M. Fiat mistura, de quâ sumatur cochleare unum magnum secundis horis, donec evanescant symptomata. (In cramp of the stomach, in spasmodic or flatulent colic, in hysteria, in hiccup, in nervous palpitations, &c.)

ASTRINGENTS.—Accti Destillati, f℥ij.; Aquæ Lauro-cerasi, f℥ij; Syrupi Rhœados, f℥vj.; Aquæ destillatæ, f℥v. M. Fiat mistura, cujus capiat cochlearia duo ampla sextis horis. (An excellent sedative astringent in chronic mucous discharges, attended with much debility and irritability of the stomach.)

Acidi Sulphurici aromatici, f℥iiss.; Syrupi Rosæ, f℥vss.; Syrupi Hemidesmi Indici (page 162), f℥ss.; Aquæ destillatæ, f℥viss. M. Fiat mistura, sumat unciam sextis horis. (A useful astringent mixture in passive hemorrhages, and in the colliquative sweating of hectic.

Tinturæ Cinnamomi compositæ, f℥iij.; Acidi Sulphurici diluti, f℥ij. Fiat mistura, cujus capiat guttas xx. ter in die, ex cyatho Decocti Hordei. (In the same cases as the above mixture.)

Aluminis, ℥iss.; Syrupi Rosæ, f℥j.; Aquæ Rosæ, f℥iv. M. Fiat mistura, cujus sumat cochleare amplum sextis horis. (In old cases of diarrhœa, and in painter's colic.)

Infusi Rosæ acidi; Decocti Althææ, ana, f℥iij.; Aluminis, ℥i.; Mellis Rosæ, f℥ij. M. Fiat gargarisma, sæpè utenda. (A useful gargle in relaxed sore throat, and in chronic ulcerations of the mouth and fauces.)

Creasoti, min. iv.; Tincturæ Gallarum, f℥ij.; Aquæ destillatæ, f℥ij. M. Fiat lotio. (In indolent ulcers with excessive discharge.)

Sulphatis Ferri; Carbonatis Potassæ, ana, ℥ss.; Mucilaginis Gummi Tragacanthæ, q. s. Fiat massula et divide in pilulas, xij.; Capiat unam ter in die. (An excellent remedy in leucorrhœa.)

Ferri Pernitratis, f℥ij.; Syrupi Simplicis, f℥vj.; Aquæ destillatæ, f℥iij. M. Capiat cochlearc amplum sextis horis. (A very useful astringent and tonic mixture in chronic mucous diarrhœa, and in leucorrhœa.)

Sulphatis Cupri, gr. vj.; Pulveris Myrrhæ, gr. xij.; Conservæ Rosæ, ℈ij. M. Divide in pilulas, xij., Sumat unam sextis horis. (In chronic diarrhœa and dysentery.)

Tincturæ Gallarum, f℥ss.; Misturæ Amygdalarum, f℥iss.; Mucilaginis, f℥ss.; Aquæ fontis, f℥vss. M. Capiat cochleare amplum post singulas liquidas dejectiones. (An excellent astringent mixture in colliquative diarrhœa.)

Pulveris Kino compositi, gr. x.; Pulveris Cretæ compositi, gr. xv.; Syrupi Zingiberis, q. s. M. Fiat Bolus, sextâ quâque horâ sumendus. (In diarrhœa occurring in the old and debilitated.)

Decocti Hæmatoxyli, f℥vj.; Tincturæ Monesiæ (page 46), f℥i.; Syrupi Aurantii, f℥i.; Fiat mistura, cujus capiat cochlcare amplum post singulas liquidas dejectiones. (In chronic diarrhœa and dysentery.)

Monesiæ, ℥i.; Aluminis; Confectionis Aromaticæ, aua, ℥ss.; Syrupi, q. s. ut fiant pilulæ xxiv.; Sumat ij. ter in die. (In leucorrhœa, in chronic diarrhœa, and in pyrosis.)

Plumbi Acetatis; Digitalis, ana, gr. vi.; Opii, in pulvere, gr. iij.; Conservæ Rosæ, gr. xij. M. Divide in pilulas sex, e quibus sumatur una ter in die. (In active hemorrhages.)

Decocti Bistortæ (page 50), f℥vj.: Decocti Papaveris, f℥ij.; Acidi Tannici, gr. xviij. M. Fiat liquor, cujus quantum satis sit quater de die, ope siphunculi eburnei, in vaginam injiciatur. (In chronic leucorrhœa.)

Acidi Tannici, gr. xij.; Conservæ Rosæ, ℥ss. M. Divide in pilulas xij. e quibus sumatur una sextis horis. (An excellent astringent in the colliquative sweating and diarrhœa of phthisis.)

Decocti Granati, f℥vij.; Mellis Boracis, f℥i. M. Sit gargarisma sæpè utendum. (In aphthous ulcerations of the mouth and fauces.)

Sulphatis Zinci, ℈i.; Aquæ destillatæ, f℥iv; Tincturæ Croci, f℥ij. M. Fiat collyrium, sæpè utat. (A useful eye-wash in chronic ophthalmia.)

Pulveris Uvæ-ursi, ℥ii,.; Acidi Tannici, gr. vi.; Pulveris Opii, gr. ij. M. Divide in portiones duodecim æquales; Capiat unam ter in die. (In passive hematuria, and in chronic catarrh of the bladder.)

Sulphatis Zinci, gr. xxiv.; Ipecacuanhæ gr. iv; Pulveris Myrrhæ, gr. xxiv.; Lactucarii; Conservæ Rosæ, ana, ℥ss. M. Divide in pilulas xxiv. e quibus sumatur una sextâ quâque horâ. (In chronic diarrhœa and dysentery.)

Calcis Chlorinatæ, ℥iv.; Aquæ destillatæ, f℥xj.; Solve et cola, dein adde, Mellis Rosæ, ℥i. M. Fiat liquor, quo gingivas sæpè gargarizet. (A most efficacious gargle in excessive salivation.

CATHARTICS.—Decocti Aloës compositi, f℥ij. Syrupi Croci, f℥ss.; Syrupi Jalapæ (page 76), f℥ij. M. Fiat mistura duabus vicibus sumenda. (In torpidity of the bowels, and in chlorosis.)

Calomelanos, gr. xxx.; Saponis Crotonis (page 71), gr. vj.; Pilulæ Colocynthidis et Hyoscyami, gr. xxiv. M. Divide in pilulas xij. e quibus sumatur una ter de die. (In spasmodic and nervous diseases.)

Pilulæ Colocynthidis compositæ; Saponis Jalapinæ (page 76), ana, ℥i. M. Fiat massula et divide in pilulas xxiv. e quibus sumantur duæ, prout res poscit. (A good formula for purgative pills for general use.)

Pilulæ Cambogiæ compositæ, ℈ij.; Pilulæ Hydrargyri, ℈i. M. Divide in pilulas xij.; Capiat ij. pro re natâ. (In constipation with deficient secretion of bile.)

Extracti Colchici acetici, gr. xij.; Pilulæ Hydrargyri, gr. xxx.; Extracti Hyoscyami, gr. xviij. M. Fiant pilulæ duodecim, e quibus sumantur duæ tertiâ quâque nocte. (An excellent cathartic in gouty and rheumatic habits, the following draught being administered the next morning.)

Succi Colchici, min. x.; Magnesiæ Carbonatis, gr. xij.; Spiritus Cinnamomi, f℥ss.; Aquæ Cinnamomi, f℥iss. M. Fiat haustus. (To be given in the morning, two of the above pills having been taken the previous evening.)

Vini Seminum Colchici, f℥ss.; Tincturæ Rhei et Aloës, f℥i.; Spiritus Myristicæ, f℥ss.; Infusi Rhei, f℥vi. M. Fiat mistura, de quâ sumantur cochlearia ampla ij. tertiis vel quartis horis ad effectum. (A useful cathartic in gouty and rheumatic habits.)

Tincturæ Colocynthidis (page 70), min. xx.; Infusi Sennæ cum Tamarindis, f℥ij.; Tincturæ Cardamomi compositæ, f℥ss. M. Fiat haustus. bis quotidie sumendus. (In dropsical cases.)

Tincturæ Elaterii, (page 72), f℥i.; Syrupi Sennæ, f℥ss.; Syrupi Zingiberis, f℥i.; Aquæ Menthæ Piperitæ, f℥i. M. Fiat haustus, quam primum sumendus et, nisi alvus sit intereà copiosè soluta, quadrihorio repetatur. (In ascites occurring in the robust, provided no inflammatory tendency be present.)

Olei Euphorbiæ Lathyris (page 72), min. vj.; Mucilaginis Gummi Arabici, f℥ij.? Tere optime simul, hisque inter terendum paulatim adjice, Syrupi Croci, f℥ss.; Aquæ destillatæ, f℥vj. Fiat haustus. (A safe and efficacious purgative draught.)

Saponis Crotonis (page 71), gr. ss.; Extracti Hyoscyami.; Pilulæ Hydrargyri, ana, gr. iv.; Olei Pimentæ, min. ij. M. Divide in pilulas ij., horâ somni sumat.

Tincturæ Hellebori, f℥iss.; Infusi Sennæ compositi, f℥j.; Syrupi Zingiberis, f℥ij. M. Fiat

haustus, primo mane sumendus. (The above pills and draught will be found very useful in cephalalgia dependant on congestion of the vessels of the head, and accompanied with a torpid state of the bowels; also in mania.)

Hydrargyri cum cretâ, gr. xij.; Pulveris Scammonii, gr. xij.; Carbonatis Sodæ siccati, gr. vj.; Pulveris Aromatici, gr. xij. M. Divide in portionibus paribus vj., e quibus sumatur una omni manc. (An excellent alterative and cathartic for children; very useful in worm cases.)

Lini Cathartici, herbæ recentis, ℥iij.; Aquæ ferventis, f℥ij.; Digere per horas duas in vase clauso, cola et adde, Tincturæ Cardamomi compositæ, f℥i. Fiat haustus. (In simple constipation.)

Resinæ Jalapæ (page 76), gr. v.; Confectionis Amygdalarum, gr. xxx.; Simul terantur, hisque inter terendum adde, Aquæ destillatæ, f℥iss. M. Fiat haustus, illicò sumendus. (An excellent cathartic in simple constipation.)

Sulphatis Magnesiæ, ℥vj.; Infusi Rosæ acidi, f℥iss. M. Fiat haustus. (An excellent purgative draught in mild febrile and inflammatory affections, accompanied with constipation.)

Mannitæ (page 80), ℥ss.; Aquæ Menthæ piperitæ, f℥ss. Solvé: Fiat haustus. (An excellent laxative for children.)

Potassæ Sulphatis, ℈ss.; Acidi Sulphurici diluti, min. v.; Aquæ Rosæ, f℥iss. M. Fiat haustus. (In mild febrile and inflammatory affections.)

Potassæ Bitartratis, ℥iv.; Acidi Boracici, ℥i.; Aquæ destillatæ, f℥xij. Fiat mistura, cujus sumatur pars quarta tertiâ quâque horâ ad plenam alvi solutionem. (In dropsical swellings.)

Potassæ Bitartratis, ℈ss.; Pulveris Jalapæ, ℥ss.; Electuarii Sennæ, ℈iss.; Syrupi Sennæ, q. s. M. Fiat electuarium, de quo sumat instar nucis moschatæ, ter quotidie, vel donec alvus commodè purgetur. (In hemorrhoidal affections.)

Infusi Sennæ cum Tamarindis, f℥iss.; Syrupi Rhei (page 89), f℥ij.; Spiritus Nucis Moschatæ, f℥ss. M. Fiat mistura, de quâ sumatur cochlearia ij. ampla secundis horis donec alvus leniter dejecerit. (In simple constipation of the old or debilitated.)

Mellis Violæ (page 101); Mannæ ana, ℈ss.; Syrupi Violæ, q. s. Fiat electuarium, cujus capiat cochleare parvulum pro re natâ. (A mild laxative, readily taken by children.)

Resinæ Scammonii, gr. v.; Confectionis Amygdalaram, gr. xxx.; Simul terantur, hisque interterendum adde, Aquæ destillatæ, f℥iss. M. Fiat haustus. (An excellent cathartic in simple constipation. The dose for children is one-third, or one-half of the above.)

Pulveris Scammonii, ℥ss.; Pulveris Jalapæ, ℥i.; Syrupi Aurantii, q. s. Ut fiant pilulæ xxiv. e quibus sumantur duæ alternis horis vel donec bis dejecerit alvus. (In the constipation of lead colic.)

Resinæ Jalapæ; Calomelanos; Saponis Hispanici, ana, gr. xv.; Olei Caryophylli, min. vi. M. Divide in pilulas xij. e. quibus sumatur una semihorio ad plenam alvi solutionem. (In obstinate constipation.)

Sodæ Sulphatis, ℥v.; Infusi Rosæ acidi, f℥iss.; Acidi Sulphurici diluti, min. ij. M. Fiat haustus (A useful antiphlogistic cathartic.)

Sodæ Phosphatis, ℥iv.; Aquæ Menthæ Piperitæ, f℥iij.; Solve, dein adde, Syrupi, Sennæ, f℥i. Fiat mistura, de quâ capiat cochleare amplum secundis horis donec alvus commodè moveatur. (A useful purgative mixture in the mild febrile affections of children.)

Olei Terebinthinæ; Olei Ricini, ana, f℥iij.; Decocti Hordei, f℥vj. M. Fiat enema. (The best purgative in *purpura hemorrhagica* occurring in children; it may be administered twice daily until the spots begin to fade.)

Caustics.—Chloridi Zinci, ℥ss.; Muriatis Antimonii, min. xv.; Farinæ, ℥i.; Aquæ destillatæ, q. s. Fiat massa, quâ pars morbida exedatur. (An excellent caustic paste in cancer, and in lupus.)

Chloridi Zinci, ℥ss.; Farinæ, ℥j. *vel*, ℥ij. *vel*, ℥iij. M. Fiat massa. (The above proportions of flour may be used according to the strength the caustic paste is wished to be; it is employed in the same cases as the former.)

Arsenici Albi, partes vj.; Calomelanos, partes xcvj. M. Fiat pulvis. Dupuytren. (Sprinkled on lint, and applied in small portions at a time to open cancer; the practice is not unattended with danger.)

Hydrargyri Oxydi nitrici; Aluminis siccati, ana, ℥i. M. Fiat pulvis. (Sprinkled on the parts to repress exuberant and spongy granulations.)

Hydrargyri Oxydi Nitrici; Amyli, ana, ℥ss.; Sacchari Puri, ℈i. Misce benè terendo simul, ut fiat pulvis subtilissimus. (In thickening of the cornea, to be blown into the eye three or four times a day.)

Carbonatis Cupri (page 109), ℥ij.; Adipis preparatæ, ℈j. M. Fiat unguentum. Devergie. (In the chronic forms of eczema and impetigo of the scalp, where stimulating applications are admissible.)

Diaphoretics—Antimonii Oxydi Nitromuriatici, ℥iss.; Muriatis Morphiæ, gr. iss.; Conservæ Rosæ, q. s. Fiant pilulæ xxiv. e quibus sumantur duæ, tertiis horis. (In chronic cutaneous diseases, and in chronic rheumatism.)

Pulveris Antimonialis, gr. iij.; Calomelanos, gr. ss.; Extracti Hyoscyami, gr. iss. M. Fiat pilula, sumenda quâque tertiâ horâ. (In acute rheumatism, and in mild febrile affections with a harsh dry skin.)

Antimonii Tartarizati, gr. ij.; Decocti Dulcamaræ, f℥vij.; Syrupi Hemidesmi (page 162), f℥i. M. Fiat mistura, de quâ capiat cochleare amplum secundis horis. (An excellent diaphoretic mixture in febrile and inflammatory affections.)

Tincturæ Guaiaci Ammoniatæ, f℥ij.; Mucilaginis Gummi Tragacanthæ, f℥vj.; Tere simul, et paulatim adjice, Misturæ Amygdalarum, f℥ij. Fiat mistura, sumenda in die partitis vicibus. (In atonic gout, in chronic rheumatism, and in chronic cutaneous diseases.)

Sarsaparillæ Radicis, incisæ, ℈iss.; Aquæ Destillatæ ferventis, Oj. Macera per horas duodecim in vase clauso, subinde agitans, dein cola.

Hujus Infusi, f℥x.; Infusi Sassafras (page 126); Decocti Mezerei, ana, f℥i.; Syrupi Hemidesmi (page 162), f℥ij. M. Fiat mistura, de quâ sumatur cyathum vinarium ter quaterve in die. (In secondary syphilitic affections, particularly the forms of cutaneous disease.)

Diuretics.—Decocti Chimaphilæ, f℥vij.; Nitratis Potassæ, ℥ss.; Spiritus Ætherei Nitrosi, f℥ss.; Spiritus Juniperi compositi, f℥iij. M. Fiat mistura; Capiat cochleare amplum quâque tertiâ horâ. (A stimulating diuretic in old cases of dropsy.)

Extracti Pareiræ, ℥i.; Carbonatis Sodæ siccati, gr. xij.; Extracti Conii, gr. vj.; Syrupi Papaveris, q. s. ut fiant pilulæ xxiv.; Capiat ij. sextâ quâque horâ. (In calculous affections, and in chronic catarrh of the bladder.)

Bitartratis Potossæ, ℈ss.; Ureæ, ℥ij.; Mellis, ℈ss. M. Fiat electuarium, de quo capiat instar nucis moschatæ, ter quotidie. (In anasarca or ascites, with deficient secretion of urine.)

Pulveris Scillæ, gr. xxx.; Potassæ Acetatis, ℈ss.; Oxymellis Scillæ, f℥ij.; Mellis, ℈ss.; Olei Juniperi, min. xx. M. Fiat electuarium, de quo capiat instar nucis moschatæ sextis horis. (In old cases of anasarca.)

Amygdalarum Dulcium decorticatarum, ℈j.; Cantharidum, in pulvere subtilo, gr. x.; Sacchari Puri, ℈ss.; Tere bene simul, et gradatim adjice, Aquæ tepidæ, f℥x. Cola. Liquoris colatæ capiat cochleare amplum tertiis horis. (In torpor of the kidneys, and in incontinence of urine caused by paralysis of the neck of the bladder.)

Olei Terebinthinæ, f℥i.; Gummi Tragacanthæ, f℥i.; Syrupi Aurantii, f℥i.; Tere bene simul, et gradatim adjice, Aquæ Menthæ Piperitæ, f℥v.; Spiritus Ætherei Nitrosi, f℥ij. M. Capiat cochleare amplum, quâque secundâ horâ. (A stimulating diuretic.)

Emetics.—Ammoniæ Carbonatis, gr. xxx.; Infusi Senegæ, f℥i.; Syrupi Croci, f℥ij. M. Fiat haustus statim sumendus. (In the suffocative catarrh of typhus.)

Emetinæ Impuræ, gr. ij.; Syrupi Aurantii florum, f℥i.; Aquæ destillatæ, f℥ij. M. Capiat cochleare amplum semihorio donec supervenerit vomitio. (A certain emetic, applicable to the same cases as Ipecacuanha.)

Violæ Odoratæ Radicis, ℥ss.; Syrupi Scillæ, f℥i. M. Fiat Bolus, statim sumendus, et post horam repetendus si opus sit. (An excellent substitute for Ipecacuanha.)

Sinapis, ℈i.; Aquæ tepidæ, f℥xij. M. Fiat mistura statim sumenda. (An excellent stimulating emetic, particularly useful when the vital powers are sinking.)

Emmenagogues.—Tincturæ Ergotæ (page 148), f℥iss.; Syrupi Croci, f℥ij.; Decocti Aloës compositi, f℥vj. M. Fiat mistura, cujus capiat cochlearia ampla ij. sextis horis. (In amenorrhœa, with torpor of the circulation.)

Tincturæ Ergotæ Æthereæ (page 149), f℥i.; Infusi Sabinæ, (page 150), f℥iiiss.; Syrupi Croci, f℥ss. M. Fiat mistura, de quâ sumatur cochlearc magnum ter in die. (In chlorotic amenorrhœâ after the use of ferruginous preparations for some time.)

Sulphatis Ferri siccati, gr. xx.; Pilulæ Aloës cum Myrrhâ, ℥i.; Olei Rutæ, min. vj. M. Fiat massula et divide in pilulas xxiv. e quibus sumantur ij. bis quotidie. (Useful in chlorosis.)

Rubiæ Tinctorum, ℥i.; Theriacæ, q. s.; Olei Sabinæ, min. xij. M. Fiat electuarium cujus capiat sextam partem ter in die. (In simple atony of the uterine organs.)

Emollients.—Olei Olivæ, f℥ij.; Vitelli Ovi unius; Syrupi Althææ, f℥i.; Infusi Lini compositi, f℥iij. Fiat mistura secundum artem; Capiat æger cochleare amplum subinde. (In inflammatory affections of the kidneys, in ardor urinæ, and as a general demulcent.)

Decocti Hordei compositi, f℥x.; Syrupi Hemidesmi (page 162), f℥ij. M. Fiat mistura, cujus sumatur cochlearia ampla duo interdum. (An agreeable demulcent and emollient mixture, useful in inflammations of the mucous membranes.)

Decocti Tussilaginis (page 170); Misturæ Amygdalarum, ana, f℥iij.; Syrupi Hemidesmi, f℥ij. M. Fiat misturæ, de quâ capiat cochlearia ampla duo horis intermidiis. (A useful demulcent mixture in chronic bronchitis.)

Decocti Althææ, f℥vi.; Decocti Glycirrhizæ, f℥i.; Tinturæ Opii camphoratæ, f℥ij.; Syrupi Hemidesmi, f℥j. M. Fiat mistura, capiat cochleare amplum tussi urgente. (In the troublesome cough of phthisis, and of chronic bronchitis.)

Epispastics.—Cantharidum, in crasso pulvere, ℥iv.; Acidi Pyrolygnei concentrati, f℥ij.; Spiritus Vini rectificati, Oj. Digere in vase vitreo clauso per dies tres, dein exprime et cola; Tinctura destillat calore gradûs 160° F. ad idoneam spissitudinem. (By this process a syrupy-looking extract is obtained, which, spread thinly on paper and applied to the skin, vesicates rapidly and freely.)

Terebinthinæ Vulgaris; Mastiche, ana, partes sex; Cantharidum, in pulvere, partes duas; Euphorbiæ Pulveris, partem unam. M. (For a perpetual blister, or to act as a powerful counter-irritant.)

Euphorbiæ, in pulvere subtilo, gr. xxx.; Adipis præparati, ℈j. M. Fiat unguentum. (An excellent issue ointment, see page 177.)

Olei Terebinthinæ, f℥j.; Vitelli Ovi unius; Tincturæ Capsici, f℥iss.; Cetacei, ℈ss.; Tere bene, et adde inter terendum, Olei Olivæ, f℥iij Fiat linimentum. (An excellent rubefacien liniment.)

Linimenti Ipecacuanhæ (page 177); Linimenti Ammoniæ, ana, p. æ. M. Fiat linimentum. (An excellent counter-irritant applied with friction.)

Expectorants.—Syrupi Hemidesmi, f℥iv.; Tincturæ Balsami Tolutani, f℥ss.; Tincturæ Opii Camphoratæ, f℥j.; Vini Ipecacuanhæ, f℥iij.; Syrupi Simplicis, f℥iij. M. Fiat syrupus expectorans, cujus sumat cochleare amplum quâque secundâ horâ. (In chronic bronchitis.)

Vini Ipecacuanhæ, f℥iij.; Syrupi Tolutani, f℥v.; Mucilaginis Acaciæ, f℥i. M. Fiat Mistura, capiat cochleare parvum omni horâ vel quâque secundâ horâ. Cheyne. (For children threatened with an attack of croup or bronchitis.)

Antimonii et Potassæ Tartratis, gr. ij.; Aquæ destillatæ, f℥vij.; Aquæ Lauro-cerasi, f℥ij.; Syrupi Simplicis, f℥vj. M. Fiat mistura, de quâ sumatur cochleare amplum bihorio. (In acute attacks of catarrh and bronchitis, combined with general antiphlogistic treatment.)

Pulveris Senegæ, gr. xxx.; Carbonatis Sodæ siccati, gr. vj.; Pulveris scillæ, gr. j.; Sacchari Puri, gr. xij. M. Divide in pulveres sex, capiat

unum quartâ quâque horâ. (In the advanced stages of hooping cough and bronchitis in children.)

Tincturæ Lobeliæ Æthereæ (page 188), f℥ij.; Misturæ Amygdalarum, f℥ij.; Succi Conii (page 235), f℥ij.; Syrupi Hemidesmi, f℥iiisss. M. Fiat mistura, cujus capiat cochleare amplum tertiis horis. (An excellent mixture in asthma and in paroxysmal coughs.)

Pilulæ Ipecacuanhæ compositæ, ℥j.; Styracis Colati, ℥ss.; Pulveris Lobeliæ, gr. xij. M. Divide in pilulas viginti quatuor, e quibus sumantur duæ sextis horis. (In old cases of bronchitis and in humoral asthma.)

Narcotics.—Succi Belladonnæ (page 193), f℥iv.; Misturæ Camphoræ, f℥vj.; Syrupi Rhœados, f℥iss. M. Fiat mistura, cujus capiat cochleare amplum sextis horis. (An excellent anodyne in neuralgia and tic douloureux.)

Tincturæ Belladonnæ (page 193), f℥ij.; Linimenti Saponis cum Opio, f℥viij. M. Fiat linimentum anodynum, sæpe utendum. (In neuralgic pains, and in painful glandular enlargements.)

Unguenti Belladonnæ ℥ij.; Camphoræ, rasæ et redactæ, ℥j; Tincturæ Opii Camphoratæ, f℥j. M. Fiat unguentum. (An excellent application to painful hemorrhoids, and along the urethra in chordee.)

Tincturæ Cannabis, f℥j; Mucilaginis Gummi Arabici, f℥ij.; Aquæ Cinnamomi, f℥iss. M. Fiat haustus, statim sumendus et repetatur secundis horis vel sæpiùs si minetur morbus. (In tetanus, or hydrophobia; half the above quantity may be taken every five or six hours in sciatica and other neuralgic pains.)

Succi Hyoscyami (page 197), f℥ss; Misturæ Camphoræ, f℥j.; Syrupi Rhœados, f℥ij. M. Fiat haustus horâ somni sumendus, et repetatur alternâ horâ si non dormiat. (An excellent narcotic draught in cases where, from any cause, opium is inadmissible.)

Tincturæ Lactucarii, f℥j.; Aquæ Destillatæ, f℥j.; Aquæ Lauro-cerasi, min. xx.; Syrupi Simplicis, f℥ij. M. Fiat haustus manè et serò sumendus. (An excellent anodyne draught in phthisis.)

Lupulinæ, gr. viij.; Mucilaginis, q. s. Fiant pilulæ duæ, horâ decubitûs sumendæ. (A doubtful narcotic, used sometimes in the restlessness and watchfulness of mania and other nervous affections.)

Morphiæ Muriatis, gr. ¼; Extracti Glycirrhizæ, gr. ij. M. Fiat pilula, horâ somni sumat. (For relieving pain and procuring rest.)

Muriatis Morphiæ Solutionis, (Ed. Phar.), min. xxx.; Aquæ Florum Aurantii, f℥i.; Syrupi Aurantii, f℥ss. M. Fiat haustus pacificus, horâ somni sumendus. (An excellent anodyne draught.)

Morphiæ Sulphatis, gr. ss.; Acidi Sulphurici diluti, min. ij.; Aquæ Destillatæ, f℥ij.; Syrupi Limonum, f℥ss. M. Fiat solutio, duabus vicibus sumenda. (An excellent anodyne where night-watchings are troublesome.)

Pilulæ Saponis cum Opio, gr. xx.; Camphoræ, rasæ et redactæ, ℥ss.; Mucilaginis, q. s. M. Divide in pilulas xij., capiat unam quâque sextâ horâ. (In priapism and irritation of the neck of the bladder.)

Tincturæ Stramonii (page 216), min. xv.; Aquæ Destillatæ, f℥j.; Syrupi Limonum, f℥ss. M. Fiat haustus tertiis horis repetendus donec dolor mitescat. (Exceedingly useful in tic dolóureux, sciatica, and all forms of chronic disease attended with acute pain.)

Extracti Stramonii, gr. ij; Extracti Hyoscami, r. vj.; Extracti Humuli, ℥ss. M. Divide in ilulas duodecim, quarum capiat unam quartâ uâque horâ dolorem lenire. (In painful nervous ffections, and in all forms of chronic disease attended with acute pain.)

Refrigerants.—Acetosellæ, ℥j.; Aquæ ferventis, f℥viij.; Infunde per horam in vase clauso, exprime et cola, dein adde, Syrupi Mori, f℥ij. Fiat mistura, de quâ sumatur cochlearia ampla duo subinde. (An agreeable refrigerent in febrile and inflammatory disorders.)

Succi spissati Sambuci, ℥ss.; Aquæ destillatæ, f℥viij.; Tere simul ut fiat solutio, dein adde, Nitratis Potassæ, ℥ss. et solve. Capiat cochleare amplum bihorio. (A useful refrigerent in hemopysis with active inflammation.)

Syrupi Aceti, f℥ij.; Aquæ Destillatæ, f℥viij. M. Fiat mistura, capiat cochleare amplum subinde. (To allay thirst in febrile affections.)

Nitratis Potassæ, gr. xv.; Aquæ Destillatæ, f℥iss.; Syrupi Limonum, f℥ij. M. Fiat haustus, ter in die sumendus. (In active hemorrhages.)

Sodæ Bicarbonatis, ℈i.; Aquæ, f℥iss.; Syrupi Simplicis, f℥ij. M. Fiat haustus in effervescentiâ cum succi Limonum recentis cochlcari magno, subinde sumendus. (To allay thirst in febrile and inflammatory disorders.)

Sedatives or Contra-Stimulants.—Acidi Hydrocyanici, min. j.; Aquæ Destillatæ, f℥vij.; Syrupi Simplicis, f℥i. M. Fiat haustus quâque secundâ horâ sumendus donec evanescent symptomata. (In gastric irritability, in nervous palpitations, in angina pectoris, &c.)

Tincturæ Aconiti (page 229), min. v.; Misturæ Camphoræ, ℥i. M. Fiat haustus, quartis horis sumendus donec dolor mitescat. (Most useful in acute rheumatism and in neuralgia; its effects should be carefully watched.)

Tincturæ Aconiti (page 229); Sucii Conii (page 235), ana, f℥ss. M. Sit pro lotione. (Exceedingly useful applied over the seat of the pain in tic douloureux.)

Extracti Alcoholici Aconiti (page 230), gr. ij.; Myristicæ Adipis, gr. xviij.; Mucilaginis, q. s., ut fiat massula. Divide in pilulas sex quarum sumatur una sextis horis. (In chronic rheumatism and other painful affections.)

Succi Conii (page 235), f℥vj.; Syrupi Aurantii, f℥x.; Aquæ Cinnamomi, f℥vj. M. Fiat mistura, cujus capiat cochleare amplum ter de die. (In chronic rheumatism, in neuralgia, and in painful spasmodic diseases.)

Creasoti, min. ij.; Mucilaginis Gummi Arabici, f℥ij.; Aquæ Destillatæ, f℥j.; Spiritus Myristicæ, f℥ss. M. Fiat haustus quâque secundâ horâ sumendus, donec sedantur vomitiones. (In obstinate vomitings.)

Succi Digitalis (page 237), min. xij.; Misturæ Camphoræ f℥j.; Syrupi Aurantii, f℥ij. Acidi Hydrocyanici, min. j. M. Fiat haustus, bis terve in die sumendus. (An excellent remedy in nervous palpitations.)

Cyanidi Potassi, gr. j.; Aquæ Destillatæ, f℥iiiss.; Syrupi Limonum, f℥ss. M. Divide in haustus octo, sumatur unus pro dosi, Donovan. (Used as a substitute for hydrocyanic acid.)

General Stimulants.—Ætheris Sulphurici, f℥j.; Cetacei, gr. ij.; Tere simul et gradatim adde Aquæ Menthæ Piperatæ, f℥j. M. Fiat haustus. (In nervous headache, spasmodic colic, fainting, &c.)

Spiritus Ætheris Sulphurici, f℥j.; Misturæ Camphoræ, f℥j.; Tincturæ Cardamomi compositæ, f℥ij. M. Fiat haustus statim sumendus, et repetatur bihorio molestante flatulentia. (In flatulent colic.)

Spiritus Ætheris Sulphurici compositi, f℥ss.; Tincturæ Opii, min. x.; Misturæ Camphoræ, f℥j.; Spiritus Anisi compositi, f℥j. M. Fiat haustus sextis horis sumendus. (A useful stimulant in the low stages of fever.)

Carbonatis Ammoniæ, gr. v.; Misturæ Camphoræ, f℥i.; Infusi Arnicæ (page 257); Spiritus Armoraciæ compositi, ana, f℥ii. M. Fiat haustus, quâque secundâ horâ sumendus. (In adynamic febrile affections.)

Olei Cajuputi, min. v.; Mucilaginis Tragacanthæ, f℥j.; Tere simul et adde, Infusi Caryophyllorum, f℥iss.; Tincturæ Ammoniæ compositi, min. vj. M. Fiat haustus. (In hysterical and nervous affections.)

Spiritus Ætheris Sulphurici, f℥i.; Solutionis Muriatis Morphiæ, min. xv.; Aquæ Menthæ Piperitæ, f℥i. M. Fiat haustus statim sumendus, et repetatur, si opus sit, quartâ parte horæ. (A powerful stimulating antispasmodic; very useful in spasm of the stomach and in spasmodic colic.)

Calcis Chlorinatæ, ℥ij.; Aquæ Destillatæ, Oj.; Solve et cola, dein adde, Mellis despumati, ℥j. Fiat gargarisma, sæpè utenda, priùs phialâ concussâ. (An exceedingly useful gargle in excessive mercurial salivation.)

Calcis Chlorinatæ, ℥j; Aqua Destillatæ, f℥x; Solve et cola, dein adde, Acidi Prussici, f℥i. Fiat lotio; Signetur, Poison. (An excellent application in chronic cutaneous diseases, when itching and tingling are very troublesome.)

Camphoræ, rasæ et redactæ, ℥ij; Mucilaginis Gummi Arabici, f℥i; Aquæ Destillatæ, f℥vij. M. Fiat mistura, de quâ sumatur cochleare amplum quartis horis. (In cases of chronic bronchitis in the old and debilitated.)

Camphoræ rasæ et redactæ, ℥ij; Lactis recentis, f℥vj; Aquæ Menthæ Pulegii, f℥ij. M. Fiat mistura cujus capiat cochleare amplum quartâ quâque horâ. (In the same cases as the above.)

Camphoræ rasæ et redactæ, gr. vj; Carbonatis Ammoniæ, gr. ix; Extracti Hyosciami, gr. vj; Mucilaginis, q. s. Fiat massula et divide in pilulas sex, quarum sumatur una bihorio. (In the advanced stages of typhoid and nervous fevers.)

Cerevisiæ Fermenti; Misturæ Camphoræ, ana, f℥vi; Tincturæ Arnicæ, f℥ij. M. Fiat mistura, de quâ sumatur cochlearia tria ampla tertiis horis. (An excellent stimulant in the advanced stages of fevers when nervous symptoms predominate.)

Muriatis Ammoniæ, ℈j; Pulveris Aromatici, grs. vi; Theriacæ, q. s. ut fiat bolus. Capiat talem sextâ quâque horâ.

Potassii Sulphureti, gr. xl; Aquæ Destillatæ, f℥vj; Syrupi Hemidesmi, f℥ij. M. Fiat mistura, cujus capiat cochleare amplum ter quaterve in die. (In rebellious cutaneous diseases.)

Tincturæ Sabadillæ, f℥i; Tincturæ Camphoræ, f℥ij; Spiritus Rosmarini, f℥ss. M. Fiat embrocatio cum panno laneo partibus dolentis applicanda. (In neuralgia and muscular pains).

Liquoris Sodæ Chlorinatæ, f℥iiss; Infusi Serpentariæ, f℥vj; Syrupi Aurantii, f℥iss. M. Fiat mistura; Capiat cochlearia ampla duo quartis horis. (In the advanced stages of typhoid fever.)

Olei Terebinthinæ, f℥iiss; Mucilaginis Tragacanthæ, f℥ss; Infusi Armoraciæ compositi, f℥iij. M. Capiat cochleare amplum unum quâque secundâ horâ. (A useful stimulant in adynamic fevers.)

Olei Terebinthinæ, f℥ss; Adipis Præparati, ℥iss; Olei Bergamotæ, min. xii. M. Fiat unguentum, mane nocteque applicandum. (In chronic eczema and impetigo of the scalp.)

Special Stimulants.—Arsenici Iodidi, gr. ij; Mannæ duræ, gr. xl.; Mucilaginis, q. s. M. Fiat massula et divide in pilulas xx, quarum capiat unam ter de die. (In psoriasis and lepra; the dose should be gradually increased, until one-fourth of a grain is taken three times a-day.)

Auri Iodidi, gr. j; Pulveris Gummi Arabici, gr. xxx. Misce intimè et divide in partes æquales quindecim, è quibus sumatur una ter in die. (In secondary syphilitic affections, the dose should be gradually increased to one-tenth of a grain.)

Auri Chloridi, gr. j; Extracti Alcoholi Aconiti, gr. x; Pulveris Glycirrhizæ, ℈ij; Syrupi, q. s. Misce intimè et divide massulam in pilulas viginti, quarum sumatur una ter in die. (In secondary syphilitic affections attended with much pain.)

Sodii Auro-terchloridi, gr. ij; Mannæ duræ, gr. l. Tere benè simul, et ope mucilaginis forme in pilulas viginti quatuor è quibus sumatur una ter in die. (In syphilitic affections both primary and secondary.)

Sodii Auro-terchloridi, gr. ij; Solve in aquæ destillatæ, q. s.; Extracti Aconiti, ℈ss; Extracti Dulcamaræ, ℥i; Althææ Radicis, in pulvere, q. s. M. Divide in pilulas lxxx, quaram capiat unam ter in die; Grötzner. (Said to be very efficacious in venereal skin diseases.)

Sodii Auro-terchloridi, gr. ij; Aquæ Destillatæ, f℥j; Syrupi Simplicis, f℥ij. M. Fiat solutio de quâ sumantur guttæ duodecim ter in die. (One of the best forms for administering the preparations of gold, as the dose can be apportioned with great accuracy.)

Hydrargyri Iodidi rubri, gr. j; Extracti Gentianæ; Extracti Chamæmeli, ana, ℥ss. M. Divide in pilulas xij. Capiat unam mane nocteque. (Alterative and tonic.)

Hydrargyri Iodidi rubri, gr. v; Spiritus Vini Rectificati, f℥j; Solve, dein adde Aquæ Destillatæ, f℥ij; Iodidi Potassii, ℥ij; Syrupi Aurantii, f℥ss. M. Fiat solutio, cujus sumantur min. xx ter in die. (In secondary syphilitic affections; every twenty minims contain a twelfth of a grain of iodide of mercury and two grains of iodide of potassium.)

Indigo (aquæ guttis nonnullis subacta), ℥ij to ℥ss; Pulveris Aromatici, gr. xv to gr. xxx; Syrupi Simplicis, f℥ss to f℥i. M. Fiat electuarium sumendum in dio in portionibus divisis.

THE

Pharmaceutical Number of the Medical Times,

FOR JUNE, IS NOW READY,

AND CONTAINS:—

I. Annuaire de Therapeutique for 1844; Translated from the French of Dr A. Bouchardat, Assistant Professor of the Faculty of Medicine at Paris, Principal Pharmacien at the Hotel-Dieu, &c.—This Translation contains an Account of every New Remedy introduced into Practice during the last Twelve Months. Among the subjects touched, are:—The Opium of Algiers; Large Doses of Opium in the Treatment of Acute Articular Rheumatism; Opiated Powder of Guaiacum; Battley's Anti-Neuralgic Liquor; Inoculation of the Salts of Morphia in Neuralgia; Pills of Morphia and Cyanuret of Potassium; Narcotic Pills; Powder against Chorea; Potion, Anti-dysenteric; Liniment, Baumes'; Opium Sparadrap; Use of Belladonna as a Preservative of Scarlatina; Belladonna in Ophthalmia; Suppository of Ungentum Populeum; Anodyne Ointment; A New Method of obtaining Conicine; Pills of Conium, Quinine, and Iron; Sedative Ointment; Plaster of Conium; Anti-Neuralgic Pills; Ointment against Sciatica; Strychneæ; Nux Vomica in the Treatment of Chorea; Pills against Gastralgia; Anti-Gastralgic Draught; Strychnine Ointment; Secale Cornutum; Preparation of Ergotine; Ergotine Mixture; Syrup of Ergotine; Pills of Ergotine; Use of the Aqueous Extract of Secale Cornutum in some cases of Chronic Disease of the Uterus; Pills against Dartrous Ulcerations: Pills of Conium and Secale; Pills of Ergot and Ioduret of Iron; Cyanic Compounds; The Cyanuret of Potassium; Anti-Epileptic Potion; Anti-Epileptic Pills of M. Bourge de Rollot; Poisoning by Bitter Almonds; The employment of some Cyanic Compounds in the Treatment of Diseases of the Eye; Hydrocyanic Collyrium; Collyrium of Cyanuret of Potassium; Ointment of Cyanuret of Zinc; Ointment of the Essence of Bitter Almonds; The Essential Oil of Bitter Almonds and Cherry-Laurel; Hydrocyanic Acid, its Use in Vapour in Diseases of the Cornea; Remarks on the Employment of Chloroforme as an Antispasmodic in Asthmatic Persons; Etherized Water regarded as a Solvent, and as a Preservative Agent; Tisane of Chenopodium Ambrosoides; Antispasmodic Potion; Cochineal Potion; Antispasmodic Lavement; Anti-Epileptic Pills; Use of Camphor; Scraped Camphor; Camphor Cigarettes; Camphorated Alcohol; Camphorated Ointment; Camphorated Oil; Use of Camphor in Diseases of the Skin; Essence of Turpentine in Epilepsy; Medicinal Employment of Napthaline; Napthaline Looch; Syrup of Napthaline; Napthaline Lozenges; Copaiba Sugar-plums; Anti-Gonorrhœal Drops; Purified and Solidified Storax; Treatment of Gonorrhœa by Pitch and Alum; Syrup of Orange Peel; Sal Ammoniac Potion; Powder against Amenorrhœa; Anti-Rachitic Syrup; Walnut Pills; Tonic and Detersive Decoction; Action of Digitalis on Chickens; Analysis of Digitalis; Digitaline; Pills of Squill, Digitalis, and Iron; Vendt's Potion; Nitrate of Potash in large Doses in Rheumatism; Use of Nitrate of Potash against Incontinence of Urine; Decoction of Marchantia; Treatment of Croup; Expectorant and Sedative Julep; Large Doses of Tartarized Antimony in Pneumonia.

2. An Original Paper on the Sulphites, containing a Series of Original Investigations conducted under the eye of Liebig. By Dr. Sheridan Muspratt, of Giessen.

3. Professor Playfair on the Functions of Oxygen in Producing Sleep and its Concomitant Phenomena—an elaborate Paper announcing Original Views on the Theory of Sleep, while lucidly explaining the principal Doctrines of Liebig.

4. Review of a Work on New Methods of Alkalimetry, and of Determining the Commercial Value of Acids and Manganese. By Drs. C. R. Fresenius and H. Will.

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11. Citrate of Peroxide of Iron.

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34. Gelatinous Capsules of Assafœtida.

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38. Preparation of the Perchloride of Iron.

39. On the quantity of Carbonic Acid expired by Man.

40. Cinchona Petoya.

41. Infusion Sennæ Frigidum.

42. On the Formation of Hydrocyanic Acid in the Preparation of Sweet Spirits of Nitre.

43. On the Preparation of Tannin.

44. On the Preparation of Alum.

45. On Rad. Gulangæ.

46. Observations on Quinovine.

47. Preparations of Tartarus Ammoniatus.

48. The Homœopathic Materia Medica examined, by Dr. Wood, &c.

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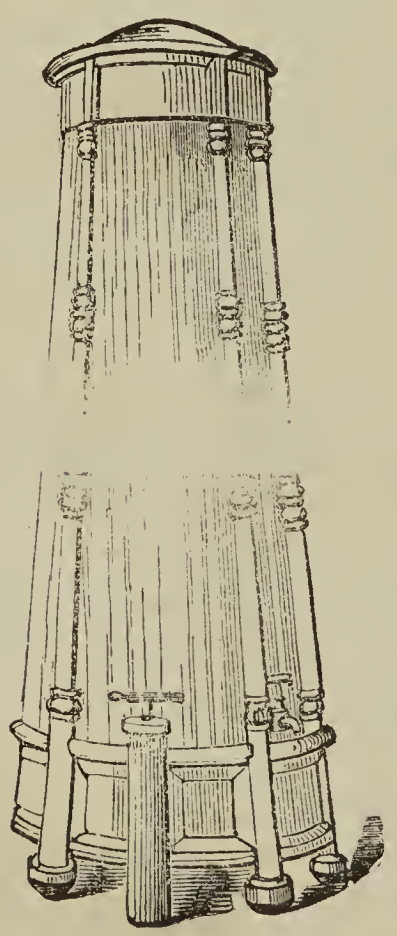

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THE MEDICAL TIMES.

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SUMMARY.

ANNUAIRE DE THERAPEUTIQUE FOR 1844. TRANSLATED FROM THE FRENCH OF DR. A. BOUCHARDAT, ASSISTANT PROFESSOR OF THE FACULTY OF MEDICINE AT PARIS, PRINCIPAL PHARMACIEN AT THE HÔTEL-DIEU, &c.

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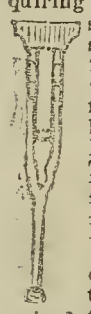

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ANNUAIRE DE THERAPEUTIQUE

For 1844.

Translated from the French of Dr. A. Bouchardat, Assistant Professor at the Faculty of Medicine at Paris, Principal Pharmacien at the Hôtel-Dieu, &c.

[Continued from p. 38.]

Iodic Compounds.—*On the influence of Temperature in the production of Iodo-forme, and of the Octahedral Crystallization of the Ioduret of Potassium.*—Many examples of the influence of temperature on chemical reactions are already known. Another is mentioned by M. Bouchardat, which appears worthy of notice. Serullas discovered iodo-forme by reacting with tincture of iodine on an alcoholic solution of potash. This plan of preparing this interesting product is rather expensive. In a memoir published in the 23rd volume of the *Journal de Pharmacie*, in which several analogous products are examined, the modifications which the process of Serullas for obtaining iodo-forme may undergo, are pointed out by M. Bouchardat, who has also made known an easy and economic process in his *Formulaire*. While repeating these experiments lately, he has made several unexpected discoveries. If to water slightly alcoholised, and holding the ioduret of potassium in solution, iodine and potash are added alternately, in sufficient quantity to decolorise and recolorise the liquid, it becomes heated, and the production of acetic ether and iodo-forme takes place successively, without any traces of the iodate of potash. But if, on the other hand, iodine is dissolved in alcoholised water, holding the ioduret of potassium in solution, and an aqueous solution of potash be added, but not in sufficient quantity to decolorise the liquid, and if more iodine be dissolved, and the potash be again added in sufficient quantity to decolorise the liquid, then no traces of iodo-forme will be produced. The oxygen, of which the iodine deprives the potash, acts upon the alcohol, and converts it into acetic ether, which may be readily isolated; but the action proceeds no further. As soon as the alcohol is changed into acetic ether, the displaced oxygen acts upon the iodine, and produces an iodate of potash, which is precipitated. Thus, under the influence of an excess of iodine, at the ordinary temperature, there is not any production of iodo-forme by the natural reaction of iodine on alcohol, under the influence of potash; acetic ether only is formed.

On the other hand, if alcohol be added to an aqueous solution of the carbonate of potash, in such a proportion that the salt shall not be precipitated, and the ioduret of potassium and iodine, in excess, be also dissolved in it, the mixture being exposed to a temperature of 138° Fahr.; after some hours an abundant production of iodo-forme takes place, the iodine remaining in excess. For a long while M. Bouchardat was unable to explain such a difference of action under such similar circumstances; he could not understand how it was that, all things being otherwise apparently equal, with caustic potash he obtained acetic ether, and acetic ether only, whilst, with the carbonate of potash, iodoforme was produced. After many fruitless attempts to discover the cause of this difference, he thought it possible that it might be owing to the fact, that with the carbonate of potash he employed a temperature of 138°, to favour the reaction, whilst the pure potash was experimented on at a temperature of from 58° to 68° only. He therefore prepared a solution of iodine and ioduret of potassium, in alcoholised water, at 138°, and added to the mixture a solution of caustic potash, when a formation of iodo-forme immediately took place, so that the marked difference in the reaction was clearly owing to the difference of temperature.

Before he became acquainted with the cause of the phenomena just alluded to, he performed several experiments, which did not lead to any result, but one of them furnished him with a result independent of the cause he was seeking for, and which he considers to be no less interesting. By evaporating the saline solution containing iodine, ioduret of potassium, and acetic ether, he obtained semi-transparent octahedral crystals, of a light yellow colour; these crystals, heated in a tube, furnished some traces of iodine, the residue consisting entirely of ioduret of potassium. A solution of the binioduret of potassium, evaporated spontaneously, yielded the same octahedral crystals. In order to obtain octahedral crystals, the presence of a great excess of iodine is indispensable. These crystals do not consist of a definite combination, for the proportion of pure iodine is extremely slight; it is not equal to 1-1000th. But it is curious to see the ioduret of potassium lose its usual form under the influence of a small portion of iodine. This rule M. Bouchardat considers may be more general than is supposed, and that many bodies may assume a form different from their usual one, by the admixture of some portions of a substance foreign to their definite composition.

Process for discovering Iodine in a Mineral Water (Bonjean).—A certain quantity of mineral water is placed in a porcelain capsule; a small quantity of solution of starch is added, and nitric acid is dropped into the mixture drop by drop, until there appears at the bottom of the capsule a violet, lilac, or rose colour, according as the water is more or less rich in iodine; it is then stirred with a glass rod, and if the colour, which is first obtained by the action of the acid, is weakened, or disappears by the agitation, another portion of acid is added by drops, the liquid being continually stirred, until the maximum of coloration is obtained. This point is easily ascertained by the fact that the intensity of the colour produced is no longer increased by the addition of the acid. A very great excess of acid will cause the colour to disappear. When a mineral water rich in sulphur is under examination, it must first be de-sulphurised; but this precaution is not necessary when it contains a very small proportion of the sulphurous principle.

Physiological effects of the Ioduret of Potassium (Ricord).—M. Ricord, who has had many opportunities of exhibiting the ioduret of potassium in different doses, has obtained some valuable information on its physiological action, of which the following is a summary. The skin is very readily acted on by the ioduret of potassium; patients who are under its influence are often seen affected with different eruptions, seated in the face or shoulders, or even all over the body. The digestive functions are generally increased in power under the influence of the ioduret; the patients improve in their appetite; the functions are better performed; and embonpoint is a very common consequence. Nevertheless, there are circumstances under which this medicine may produce pathological effects on the digestive apparatus. One of these effects, which is very remarkable and very constant, consists in a pain which is felt in the great culde-sac of the stomach, and which, by the manner in which the patients complain of it, may be mistaken in the first instance for a pleurodynic pain of the left hypochondrium. This pain is sometimes very severe, without any increase of the thirst, without the appetite being in any way disordered, without there being any appearance in the tongue to indicate disorder of the stomach, and without there being any reaction in the circulation. In a great number of persons the ioduret of potassium may give rise to a rather free salivation, very much resembling the ptyalism of pregnant women. The mucous membrane of the mouth is not inflamed, the salivary glands are not swollen, and the breath is not fetid, as in mercurial salivation. The quantity of urine is almost always increased, and that in a remarkable manner, under the influence of the ioduret of potassium. The circulation has not appeared to M. Ricord to be sensibly influenced by the ioduret of potassium; it seemed to him, in some instances, to render the blood less plastic, and to predispose to nasal, pulmonary, and even intestinal hæmorrhages; and it has caused a species of ophthalmia, to which he has given the name of œdematous catarrh. Under the influence of this salt, there sometimes occurs, as in simple coryza, some obstruction in the nasal fossa, rheum, and very rarely any sneezing; the mucous secretion is much increased, but this fluid is thus far peculiar, that it is ordinarily less viscid, and has not any tendency to pass to the purulent condition. This coryza is sometimes very inconvenient. M. Ricord has twice seen it during the past year, accompanied by so intense a cephalalgia as to cause serious disquiet, and yet the patient had not taken more than a scruple of iodine. The coryza is sometimes replaced by a peculiar bronchitis, with a slight cough, and some difficulty of breathing. The action of the ioduret of potassium on the nervous system is not often manifested, but it is very remarkable. M. Ricord has seen it cause a slight degree of cerebral excitement in some patients; signs of slight congestion, which have given rise to something analogous to the drunkenness caused by alcoholic drinks; some persons have suffered from spasmodic cramps, and slight subsultus tendinum.

Action of the Ioduret of Potassium on the Articulations (Winn).—A young man, twenty years of age, who was labouring under hæmoptysis, with superficial and indolent inflammation of the throat, was submitted to the treatment by the ioduret of potassium, for swelling of the articulation of the wrist. The treatment succeeded, but with this peculiarity, that as the state of the throat improved, the articulation of the wrist became more swelled and inflamed, and it returned to its normal state when the iodine was given up. As the same occurrence took place whenever iodine was exhibited, the author was led to attribute it to the action of this medicine. Dr. Jervis, with whom Mr. Winn attended this case in consultation, states that he has met with an analogous case. Dr. Belmano has also mentioned a case of swelling of the finger-joints in a patient who was taking iodine. These cases are as yet very rare, but they are also very curious, if they are taken into consideration with the employment of the ioduret of potassium in rheumatism.

Dose in which the Ioduret of Potassium should be given in the treatment of Constitutional Syphilis (Ricord).—In the majority of cases this remedy may be given in the dose of a gramme and a half, given in three doses in the day. Five or six days are generally requisite for the exhibition of the same dose before its effects can be judged of. If the symptoms are not improved, and no unpleasant result follows, each dose may be increased by half a gramme, three grammes being consequently given in the day. This dose is to be continued for five or six days, then augmented, diminished, or kept *in statu quo*, according to the effects. The experience of M. Ricord on this point is very extensive, and he says we have rarely occasion to exceed three grammes daily, and that six grammes is the maximum dose; and, on the other hand, it is exceedingly rare to be obliged to give less than a gramme and a half in the twenty-four hours.

On the Employment of the Ioduret of Potassium (Lisfranc).—M. Lisfranc has called the attention of his pupils to the importance of the dose in the exhibition of the ioduret of potassium. He says, the dose that should be given must always be proportionate to the constitution, temperament, and idiosyncrasy of the patient. The ordinary dose at the commencement, he says, is one gramme in solution in 120 grammes of distilled linden water, which is to be taken in three doses, each in a glass of sugared water, in the twenty-four hours. Some physicians begin by three or four grammes, but this dose is too large at the beginning. Lisfranc begins with one gramme, increasing it four grains every third or fourth day; he thus raises it to three or four grammes, sometimes even to five or six, or even eight grammes, but he never gives more than the last-named quantity. His medium dose is three or four grammes, two night and morning. The ioduret of potassium, contrary to the action of pure iodine, soon produces a certain degree of embonpoint; such, at least, is its most general effect. Those cases in which it causes emaciation are exceptions, as are those also in which it induces atrophy and the disappearance of glands. In whatever dose it is exhibited, if it produces dangerous symptoms, its use must be suspended. The primary symptoms generally disappear with great facility. It is remarkable that in general the action of the medicine is continued long after its use has been suspended. In this case the cessation of its pathological symptoms must not be taken as a guide for its resumption, which should not be had recourse to until its therapeutic action

has completely ceased, and it is then to be resumed in doses varying according to circumstances, and the state of the patient. When the constitution of the patient is very bad, the ioduret of potassium generally succeeds worse than under the contrary circumstances. This medicine has a special action, and a surprising efficacy in constitutional syphilis; many remarkable examples of this have been published by Lisfranc. It is also of service in the treatment of scrofula, but its use must be continued a very long time, and the doses gradually raised, in order to obtain satisfactory results. The ioduret of potassium, used in the treatment of atonic ulcers, does not furnish less remarkable results.

Employment of the Ioduret of Potassium in Rheumatism (Bounyer)—In the Annuaire for 1841 was published the formula recommended by M. Bounyer for the use of the ioduret of potassium in the treatment of rheumatism. He observes that this salt is a remedy of known efficacy in the treatment of chronic articular rheumatism and periostitis, and sometimes even of acute rheumatism, especially if its employment has been preceded by the antiphlogistic treatment used without effect, or only partially curative. This medicine succeeds equally well in cases where there is not any syphilitic complication, and where there is, even where the ordinary ante-syphilitic remedies have failed. M. Forget has not been so successful as M. Bounyer in the treatment of acute articular rheumatism with the ioduret of potassium.

Employment of the Ioduret of Potassium in Deafness, connected with Suppurating Phlogosis of the Mucous Membrane of the Nose and Ears (Yearsley).—Besides the ordinary local measures—such as moxas, blisters, Autenrieth's ointment applied behind the ears, and air-douches into the cavity of the tympanum—the author has derived great advantage from the exhibition of small doses of the ioduret of potassium internally. According to him, this preparation exerts a beneficial influence on the mucous membrane of the throat and ear, diminishes the secretion, removes the tumefaction and increased vascularity, restores them to their natural state, and thus dissipates the tinnitus. The ceruminous secretion of the meatus externus, which is suppressed, is re-established under the influence of this medicine, when given in one or two grain doses, largely diluted. I am convinced, says Mr. Yearsley, that no other medicine can produce such salutary effects in these cases, if it be administered in small doses for a very long time. In general, three or four days after the patient has begun taking the hydriodate of potash, he is subject to sneezings, headache, a feeling of weight and sinking, together with an abundant secretion from the eyes and nose, and all the symptoms of influenza. The symptoms of catarrh, however, soon disappear, and, until that takes place, the patient must not expect any benefit, for, during the early phenomena caused by the action of the remedy, the deafness is increased. The author employs, conjointly with this remedy, which he regards as very essential, astringent gargles; and that which he has found most successful is composed of four grammes of the sulphate of alumen and potash dissolved in 250 grammes of infusion of roses. This gargle diminishes the secretion of the throat, and removes the nausea caused by the relaxation of the mucous membrane.

The author adds to these observations by remarking that if the signs obtained by the air-douche and by the stethoscope shew that the mucous membrane of the cavity of the tympanum is thickened, its resolution must be sought by the daily application of the iodine ointment behind the ears, and along the edge of the lower jaw. When the suppurative process has extended from the cavity of the tympanum to the external meatus, otorrhœa is the result, which, however, does not, according to the author, render the case more serious. The cure may be equally well effected, certain precautions having been previously had recourse to. In the first place, all astringent injections into the external meatus should be avoided, as they would speedily suppress the discharge, and give rise to more dangerous symptoms. The practice which has succeeded best with him in this case consists in applying on the parietes of the meatus externus, once or twice a-day, by means of a small and soft brush, a liquid composed of from one to two grains of the sulphate of zinc and alum dissolved in thirty grammes of rose water. This plan gradually diminishes the secretion, and finally arrests it in a month or two, without injuring the sensibility of the membrane of the tympanum, as an injection would do.

Gaseous Iodurетted Water (Mialhe).—Ten grains of the ioduret of potassium, two grammes and a half of bicarbonate of soda, two grammes and a half of sulphuric acid diluted with its own weight of water, and 320 grammes of pure water. The two saline compounds are dissolved in the water, and filtered; the filtered product is introduced into a half bottle for holding gaseous water; the sulphuric acid is added, and the bottle corked at once. *** This quantity to be taken during the day.

Anti-goitrous Bolus (Righini).—Twenty grammes of purified animal charcoal, ten grammes of gum arabic, five grammes of ioduret of potassium, one gramme of Ceylon cinnamon, and a sufficient quantity of syrup of orange-peel; the whole to be made into thirty boluses, one to be given evening and morning, the patient being directed to allow it to melt in the mouth.

Anti-herpetic Syrup, No. 1 (Duchesne-Duparc).—Four grammes of the ioduret of iron, thirty-two grammes of the less centaury, thirty-two grammes of fumitory, thirty-two grammes of dulcamara, made into 125 grammes of decoction; thirty-two grammes of rhubarb made into sixty-four grammes of decoction, and a sufficient quantity of simple syrup to make 500 grammes of syrup. *** The dose is from two to six spoonsful daily.

Anti-herpetic Syrup, No. 2.—Eight grammes of the ioduret of iron, one gramme and a half of socotrine aloes, two grammes of daphne mezereon, 32 grammes of sarsaparilla, 32 grammes of sal vegetabilis, and a sufficient quantity of simple syrup to make 500 grammes of syrup. *** The dose is from one to four spoonsful daily.

Depurative Bolus, No. 1 (Duchesne-Duparc).—Three grammes of sulphuret of iron, ten grammes of powdered rhubarb, and a sufficient quantity of syrup to make 100 boluses, equal in size, which are afterwards to be silvered. *** The dose is from two to six daily.

Depurative Bolus, No. 2.—Five grammes of sulphuret of iron, two grammes and a half of socotrine aloes, eight grammes of rhubarb and cinchona, and a sufficient quantity of syrup of honey to make 100 boluses, of equal size, which are afterwards to be silvered. *** The dose is from one to four daily.

Surgical Treatment of Dropsies (Velpeau).—In the second edition of his *Formulaire*, M. Bouchardat has published the formula of the solution used by M. Velpeau in the treatment of hydrocele. The following is an extract from a work recently published by M. Velpeau on the surgical treatment of dropsies. He says, being desirous of ascertaining if the serous cavities could recover by means of iodine injections, as he supposed theoretically, he performed a series of experiments, which, as will be seen, have had a double result. He practised iodine injections into the peritoneal cavity of a dozen dogs. The peritoneum was selected as being the largest cavity of the economy, and consequently, if the effects of the injection in that case were not fatal, it could be practised everywhere else with impunity. The result of his experiments is that a very strong iodine injection into the peritoneum rapidly causes death, but if prepared with a very small quantity of iodine, the requisite proportion of which has been fully ascertained, it only occasions symptoms which are easily removed; and in no case either of the animals who have died from its use, or in those who were killed, has the inflammation manifested any tendency to suppuration. The animals that survived have taken food and drink from the third day, and were convalescent by the tenth. Adhesions have taken place most frequently between the intestines and the other viscera, without any being formed between the latter and the parietes of the abdomen. Glutinous and gelatiniform in the beginning, these adhesions are often found reduced to simple shreds, more and more supple and extensible, the greater the distance of time after the injection. Having thus obtained the certitude that with the tincture of iodine introduced into the shut cavities, a merely adhesive and not purulent inflammation is induced; that when infiltrated in the tissues, it does not cause gangrene; that the adhesions which it causes are destroyed by the movements of the organs, and that the shut cavities may be restored after having been destroyed; M. Velpeau has thought himself authorised to apply the tincture of iodine to the treatment of a great number of cases of dropsy.

Desirous, however, of proceeding from the more simple to the more serious forms of the disease, he commenced with the most common form—that of hydrocele, in the treatment of which irritant injections had been already used. From that he tried it in encysted hydrocele, congenital hydrocele, hydrocele of woman, and, finally, in that of herniary sacs, in treating which practitioners did not dare to use the vinous injection. After these primary essays, he proceeded next to attack dropsies of the subcutaneous bursæ, and he thus used the tincture of iodine in the bursæ on the dorsum of the foot, around the ancles, in front of the patella, at the back of the knee-joint, in the popliteal space, in front of the head of the tibia, and even in the body of the thigh.

It being requisite, in order to obtain a cure of certain dropsies, to induce an attack of adhesive inflammation, but fearing the occurrence of suppuration, it became necessary to seek for a substance which should always excite the one without any fear of causing the other. A certain number of means of this kind were already used in practice, as regarded hydrocele. Wine, which has hitherto been found the most efficacious, succeeds very well, but, among others, it has the serious inconvenience of causing gangrenous inflammation when it is infiltrated in the tissues. The fear of a similar consequence has naturally prevented surgeons from employing the vinous injection in other regions, or in larger serous cavities than that of the scrotum. M. Velpeau believes that the tincture of iodine diluted with water is a more appropriate application. Introduced through a puncture into the shut sacs, this liquid causes almost constantly the adhesion of the opposite parietes of the cavity which it touches. Infiltrated into the cellular tissue, it does not cause gangrene; of this fact M. Velpeau is assured by the result of numerous experiments; he has injected it under the skin and between the muscles of several animals—dogs and rabbits, for instance—and in no case did either serous inflammation or gangrene arise. At the end of four or five days there did not exist the slightest trace of pain in the part where the infiltration took place. As he has observed the same thing in man, after certain operations for hydrocele, he has no hesitation in saying that the tincture of iodine, diluted with a sufficient quantity of water, does not give rise to gangrenous inflammations when it is infiltrated into the tissues. Hygroma, nodus, and the hydatidiform tumours of the wrist, have been attacked in the same manner, and in no case has the injection produced serious consequences. Ganglionic and glandular dropsies, the voluminous cysts in the hollow of the armpit, the supra-clavicular region, the parotid region, and the sub-maxillary region, have yielded to this mode of treatment with more facility, perhaps, than dropsy of the scrotum. Similar tumours developed in the breast, have by these means been caused to disappear in a week or two. A more serious malady—one less accessible to ordinary measures—the goitre, is also capable, in certain cases, of being submitted to the same mode of treatment. When the tumour contains a transparent or opaque liquid substance, it yields as readily as ordinary hydrocele to iodine injections. M. Velpeau has thus obtained a cure in six cases.

In all these cases there was no fear of being arrested in the use of irritant injections, either by the inconvenience which might result from the obliteration of a shut sac, nor by the danger that might arise from excessive inflammation; the same, however, could not be said of the joints when affected with dropsy. However, having ascertained that the tendons around which the iodine had been

injected, readily regained their mobility after the operation, encouraged by the facts already mentioned, and convinced that suppurative inflammation might be avoided, Velpeau applied the same plan of treatment as for hydrocele to certain diseases of the joints. As old, obstinate cases of hydrarthrosis, when combatted unavailingly by the ordinary plan of treatment, sometimes terminate in a serious disease requiring the amputation of the limb, M. Velpeau considers the circumstances justified his adopting the operation in question. The experiments of a celebrated surgeon, M. Bonnet, of Lyons, which were carried on at the same time, have been performed on at least twenty patients. Those which Velpeau himself instituted have not produced such a frightful list of symptoms as practitioners have hitherto anticipated. A rather severe pain at the moment of injection, agitation, with insomnia, and slight fever, and a moderate inflammatory swelling, lasting for some days; such are the immediate results of the operation. The resolution of the tumour is soon effected, and the movements of the limb, at first impeded, are speedily restored perfect in patients affected with simple hydrarthrosis; so that we are warranted in saying that dropsy of the articulations may be safely treated by iodine injections.

M. Velpeau, in conclusion, inquires if we may hope that certain varieties of spina bifida, of hydro-pericardium, of hydrothorax, and ascites, may also be cured by this plan of treatment? It would be rash, he says, to answer this question in the affirmative, without previous experience and direct observation; but he thinks the facts in his possession and analogy are sufficient to justify new experiments in that direction; and he adds, that iodine injections have succeeded with him equally well in purely liquid hæmatoceles as in hydrocele.

Collyrium of Iodine, with the Ioduret of Potassium (Desmarres).—Twenty grammes of distilled water, one gramme of ioduret of potassium, one fifth to three fifths of a grain of iodine. Used in spots of the cornea, when there are not any traces of inflammation.

Sulphurous Iodurетted Solution (Baumès).—Three grammes of the ioduret of potassium, five grammes of the sulphuret of potash, 200 grammes of distilled water. Used in papular, tubercular, and squamous eruptions, unattended with symptoms of irritation.

Ointment of the Ioduret of Potassium.—When the ointment of the ioduret of potassium is intended to be used in frictions on parts where the skin is very fine or easily acted on, the following formula should be adopted:—one gramme of the ioduret of potassium, ten grammes of cerate without water, one gramme of rose water, two drops of essence of roses. *** When the tumours which are to be removed are accompanied with severe pain, the following may be added to the ointment: either ten grains of the iodhydrate of morphia, or two grammes of camphor.

The following are certain external preparations, used in Germany, containing either iodine or the ioduret of potassium:—

Hydriodated Ointment (Riecke).—Four grammes of the ioduret of potassium, two grammes of medicinal soap, eight grammes of rose-water, twenty-four grammes of rose-ointment, mixed together, *secundem artem.* *** This ointment has the advantage of not becoming rancid so soon as the ordinary ointment, and of keeping for a much longer period.

Iodurетted Plaster (Roderburg).—Two grammes of pure iodine, divided with a few drops of spirit of wine, then a little olive oil added, and the whole very carefully incorporated with thirty-two grammes of simple plaster, previously melted in a water bath.

Hydriodated Plaster (Roderburg).—Five grammes of the ioduret of potassium, rubbed down with a little spirit of wine, and afterwards very carefully incorporated with forty grammes of simple plaster, previously melted in a water bath.

Cod and Ray Liver Oil.—No one at present denies the energetic action on the animal economy, of iodic preparations, and their therapeutic utility; but the following fact respecting them is deserving the attention of practitioners: it appears that the iodine which is most frequently found in the state of ioduret of potassium, or calcium, in certain natural products, as in sponge, the fuci, and cod and ray liver-oil, may possess a useful action in very small doses, free from the inconveniences of this heroic remedy employed in large doses. Cod and ray-liver oil have long been employed at Hamburgh, in Belgium, and in Holland, in the treatment of rickets, in scrofulous, gouty, and rheumatic affections; it has also been employed externally in frictions on the skin, in phthisis laryngea, &c. Ray-liver oil appears to possess the same medical properties as cod-liver oil, and is even preferred to it by many medical men in Belgium, and the north of France. Dr. Vingtrimer employs it frequently; he obtains it by boiling the ray's liver in water; the oil floats on the surface of the water; it is decanted, and clarified by rest and fresh decantations. It is certainly the best plan of obtaining the liver oil either of the ray or cod, for that which is met with in commerce is often falsified with some fish oil, or else is so rancid that the patients are soon disgusted. This oil, when freshly prepared, has a clear yellow colour; its odour reminds one of whale oil, or of that of fresh pilehards. It contains a little iodine, for Messrs. Girardin and Preissier have obtained three grains and a half of ioduret of potassium from a quart, whilst the cod oil has only furnished three grains of the same ioduret. It ought, therefore, to be preferred as a medicine, more especially as it is infinitely less disagreeable to the sight, taste, and smell, and it can be easily prepared. As ray oil does not contain any other active principle differing from those which essentially constitute the different fatty bodies, it has been hitherto admitted that its therapeutic action, which has been demonstrated by many observers, is owing to the ioduret of potassium, although the proportion which it contains of that salt is very small. But the great division of this ioduret in the mass of oil, the peculiar state of combination in which it is found, must singularly assist its absorption into the tissues, and may thus contribute more than the absolute proportion of the salt, to the marked effects that the oil exerts upon the animal economy. It is also possible that the iodurетted oil, not being eliminated from the economy as are the other soluble preparations of iodine, the action of the iodic compound may be thus more slow, more sustained, and more regular, for the ioduret is only set successively at liberty in the economy, as the oil becomes decomposed, which is always effected gradually. In addition to the efficacy of the ioduret of potassium, it is certain that in some individuals the daily administration of a certain quantity of oil may beneficially modify the constitution.

The existence of the ioduret of potassium in the oil of the ray and cod liver is a new connection between iodic compounds and many other agents of alterative medicine; is it not a fact that many of them, and especially arsenic, is more readily discovered in the liver than in the other organs?

Use of Cod-Liver Oil in the Tubercular Disease of Infancy (Panck).—M. Panck, who is charged with the inspection of the service of orphans, at Moscow, admits the efficacy of cod-liver oil in treating the scrofulous diathesis; and he is also of opinion that it possesses great power in the commencement of tubercular disease in children. "I have succeeded," he says, "in a great number of cases, where I have been called early, in arresting the progress of this disease. Scarcely have I given the cod-liver oil for several weeks before the cough disappears, the pain in the chest is relieved, the febrile symptoms give way, and the patient improves in appearance. But, on the other hand, when phthisis is far advanced, this plan of treatment is generally as powerless as the others which have been before so much vaunted."

Syrup of Ray-Liver Oil (Mialhe).—Six hundred grammes of sugar, fifty grammes of bitter almonds, fifty grammes of powdered gum arabic, one hundred grammes of ray-liver oil, and three hundred grammes of pure water. The almonds are first to be beaten up with the gum arabic, and about fifty grammes of the sugar; to these is to be gradually added the oil, first mixed with about one hundred grammes of water; these are to be beaten together for a long time, and then the rest of the water which is to be used in preparing the syrup, is to be gradually added. The emulsion is then to be filtered, and the sugar melted in it, at a low temperature, never exceeding 104° Fahr., in order to prevent the coagulation of the albuminous part of the almonds. It is afterwards to be set aside to cool, and then aromatised with fifty grammes of orange-flower water.

Treatment of Phthisis by Cod-Oil (Pereyra).—Dr. Pereyra, a physician at Bordeaux, attributes a great efficacy to cod-liver oil in pulmonary phthisis. He employs a purified, but still a coloured cod-liver oil, and generally gives a spoonful evening and morning. Some patients refuse to continue its use, on account of its nauseous odour, but the greater part, after having experienced some disagreeable feelings from it, and after having thrown it up two or three times, become more accustomed to it. It is necessary to add that M. Pereyra, besides using this medicine, conjoins with it the use of a seton on the more diseased side of the chest, and also orders substantial nourishment, which he rapidly increases to full diet, composed of boiled or roast meats, and a pint of wine. He practises in a country famous for its wines. We should also add that the oily bodies which are absorbed by the chyliferous ducts, and which are constantly burnt in the circulatory apparatus, are extremely useful in chronic diseases of the respiratory apparatus. Cod-liver oil does not act differently from any other oil in the treatment of phthisis, but it is possible that its viscid state may favour its absorption, for is it only when the oil is absorbed that it can be of use. In these cases, its purgative effect must be carefully avoided.

Use of Cod-Liver Oil (Stœber).—M. Stœber concludes from his observations that cod-liver oil has but little efficacy in cases of glandular enlargements of the neck, and, on the contrary, is really efficacious in scrofulous diseases of the osseous system.

The following preparations, having the ray or cod liver oil for their basis, have been recently strongly recommended.

Soap of Cod-Liver Oil (Deschamps).—Sixty grammes of cod-liver oil, eight grammes of caustic soda, twenty grammes of water; the soda is to be dissolved, and then the articles mixed together. This soap may be employed in the manner of plaster, and may be used to dress wounds, for it is not alkaline. Eight grammes of soap are equal to five grammes and a half of oil.

Saponaceous Ioduret of Potassium (Deschamps).—Four grammes of the ioduret of potassium, four grammes of water, thirty grammes of cod-liver oil-soap, mixed together.

Balsam of Cod-Liver Oil (Deschamps).—Sixty grammes of cod-liver oil-soap, sixty grammes of alcohol at 90°. The ingredients to be melted together in a water-bath, and put up afterwards in opodeldoch bottles. Thirty grammes of the balsam are equal to eleven grammes of the oil.

Treatment of Goitre (Pistchaft).—Iodine and its different preparations are, according to M. Pistchaft, contra-indicated in persons of a sanguineous temperament. When individuals of that temperament are affected with goitre, he prescribes the use of the following ointment:—ten grammes of borate of soda, five grammes of purified opium, forty grammes of rose ointment mixed together, and made into a perfectly homogeneous ointment. It is to be used in frictions twice a day, on the tumefied part. Opium and the borate of soda are generally two excellent discutient remedies. This ointment may, says M. Pistchaft, be prescribed with advantage, in cases of varices of pregnant women.

Chloruret of Barium Mixture (Luteroti).—One gramme of chloruret of barium, 100 grammes of distilled camomile water, mixed together; ten drops to be taken every two hours. The author asserts that by this means he has cured tic douloureux in a scrofulous subject in ten days.

Employment of the Chloruret of Sodium in Diseases of the Eye (Tavignot).—M. Tavignot employs the chloruret of sodium in substance; in an ointment made with from five to fifteen grammes of the salt, to thirty grammes of lard;

and in collyrium, from fifteen to forty grammes of salt, to 125 grammes of water. The topical applications of this salt have been found efficacious by M. Tavignot, chiefly in cases of ulceration of the cornea.

Salts of Lead, Zinc, and Tin.—*Mixture against Chronic Blenorrhagia* (E. Marchand).—Eight grains of crystallized acetate of lead, two grains of morphia, four grammes of acetic acid, two hundred grammes of distilled water, and sixty grammes of simple syrup. Three spoonsful to be taken in the course of the day, two hours before each meal.

Camphorated Saturnine Ointment (Baumès).—Ten grammes of extract of lead, two grammes of camphor, thirty grammes of lard. Used for the removal of the spots which remain after papular and other syphilides.

Discutient Saturnine Ointment (Baumès).—Ten grammes of extract of lead, one gramme of camphor, one hundred grammes of cerate. Used to dress indolent chancres, chilblains, ulcers, &c.

Treatment of Lacrymal Tumour (A. Bèrard).—Before having recourse to an operation in cases of fistula lacrymalis, M. Berard employs the following treatment:—Firstly, he gives, every ten days, a purge, composed of forty-five to fifty grammes of the sulphate of magnesia, dissolved in an infusion of herbs; secondly, frictions are practised evening and morning over the tumour, and on the corresponding side of the nostril, with the Neapolitan ointment; thirdly, a few drops of the following collyrium are instilled three times a day between the eyelids, principally near the inner canthus:—four grains of sulphate of zinc, thirty grammes of distilled water, fifteen drops of laudanum; fourthly, the patient takes the infusion of walnut leaves, and sniffs the decoction of the leaves several times a-day; and, fifthly, a foot-bath is taken every second day.

Henke's Ointment.—Two grammes of oxide of zinc, one grain of powdered opium, thirty grammes of fresh butter. Used in chronic impetigo.

Therapeutic Employment of the Chloruret of Tin (Nauche).—M. Nauche has recommended the chloruret of tin in cancerous affections, and the following are the formulæ in which he prescribes it:—

Solution of the Chloruret of Tin.—Twenty-five milligrammes of the chloruret of tin, five hundred grammes of distilled water. This solution is given to the patient in the dose of an ordinary teaspoonful daily; each dose is taken in a cupful of gum water. M. Nauche also prescribes the solution in lotion as a dressing for cancerous ulcers.

Ointment of the Chloruret of Tin.—One to two grains of the chloruret of tin, thirty grammes of lard, mixed together, and made into a very homogeneous ointment, which is to be divided into eight equal portions, one of which is to be employed daily in friction, on the inner parts of the legs or thighs. M. Nauche avers that he has derived great benefit from the use of these two preparations in cases of glandular enlargements, in scirrhous affections, and even in the treatment of ulcerated cancers.

Treatment of Syphilis by Tartar Emetic (Smee).—From twenty to sixty drops of tartar emetic wine are given every two or three hours in half a glassful of sugared water, and the ulcerated parts are washed with the chloruret of soda. This plan of treatment is recommended in constitutional syphilis. The assertion of Mr. Smee is interesting, and if confirmed, it establishes a new relation between arsenical and antimonial preparations.

Epispastics, Revulsives, &c.—*On a means of increasing the efficacy of English Blistering Plaster* (Mueller).—When the blistering plaster does not produce the effect that is expected of it, it must be attributed, according to Dr. Mueller, to the vesicating principle remaining enclosed in the cantharides. M. Mueller advises to allow the cantharides to digest in the mass of the plaster at a gentle heat for five or six hours. The advice is good, and is adopted by the greatest number of modern pharmacologists.

English Blister Plaster (Langlois).—One hundred and thirty grammes of lard, eighty grammes of yellow wax, twenty-five grammes of white pitch, 125 grammes of powdered cantharides. The plaster thus prepared, says M. Langlois, is preferable to that of the Codex, because it is more ductile, and not adherent, and its effect is certain and speedy.

Epispastic Ointment (Bizet).—Sixty grammes of lard, thirty grammes of mezereon, four grammes of white wax, two grammes of pepper, and fifteen drops of laudanum. The pepper and mezereon, previously bruised, are macerated for five or six hours in the lard, in a water bath, then strained and filtered while hot. The wax is next melted in the ointment, and the mixture well stirred; when it is nearly cold the laudanum is added, and the ointment again well stirred until it is cold. This ointment keeps blisters and issues freely suppurating, without causing pain, and does not induce any of those affections of the genito-urinary organs, which are produced by the ordinary ointments which contain cantharides.

Milan Flies,—Mouches de Milan (Louradour).—One hundred and twenty five grammes of resin elemi, 125 grammes of liquid storax, 150 grammes of yellow wax, thirty grammes of camphor, 250 grammes of finely powdered cantharides. This plaster produces vesication quickly, and with certainty. It should be spread on court plaster.

Acetic Extract of Cantharides (J. Ph.)—Four grammes of cantharides, one gramme of pyroligneous acid, sixteen grammes of alcohol at 85°. These drugs are to be digested in a water bath at a temperature of 104° to 120° Fahr., strained with expression, then distilled, and evaporated at a gentle heat. A product of a butyraceous consistence is then obtained, which may replace the ethereal oil of cantharides, recommended of late years by M. Trousseau, and which is very valuable when it is fresh, but when it is kept some time the cantharidine sometimes gradually separates in form of crystals, and the vesicating property is lost. The cantharadine does not crystallise in the acetic extract. In order to employ it, all that is necessary is to rub the extract over a piece of paper and apply it to the skin. A blister will then soon form.

Rheumatismal Derivative Paper (Berg).—Thirty grammes of euphorbium, fifteen grammes of cantharides, 150 grammes of alcohol, digested together for eight days, and then sixty grammes of colophane, and fifty grammes of turpentine added. Three layers of this varnish are laid on a piece of paper.

Derivative Paper (Pirwitz).—Fifteen grammes of powdered cantharides, 100 grammes of guaiacum resin, 100 grammes of galbanum, 200 grammes of alcohol, digested together for eight days, and then eighty grammes of turpentine from the pine tree, and thirty grammes of turpentine from the larch tree added. This varnish is to be spread on paper, several layers being necessary. It is used in the same way as the plasters of Burgundy pitch.

Anti-Rheumatic Paper of Germany.—Three hundred grammes of black colophane, 100 grammes of yellow wax, 200 grammes of fluid black pitch. This preparation, after having been liquified at a gentle heat, is to be spread in a thin layer on segments of paper of an elongated form.

On the Employment of the Essence of Mustard (Pichot).—Dr. Pichot has communicated to M Bouchardat some interesting observations on the essence of mustard, of which the following is an extract:—"While glancing over the formulary I found a note on the essence of mustard, which appears to me to be a serious error, the more prejudicial to science as your work is one of authority, and young practitioners may be deprived by it of a very active substance, which does not possess the injurious properties attributed to it by you. I have frequently had occasion, in the course of my practice to employ the essence of mustard in cases of very severe diseases of the nervous centres. It is a very energetic rubefaciant, and vesicant only under certain circumstances. It has never produced eschars on the skin. The only objection that can be made to this therapeutic agent is that it fills the apartment with vapours, the action of which on the conjunctiva is very painful. I use it in the following manner:—I place in the bottom of a saucer a square piece of fine linen, from five to ten centimetres wide, according to the age of the patient, and allow a few drops of the essence to fall on different parts of the linen, so that it shall be completely impregnated without wetting the saucer. I then apply the linen to the thigh or calf, and cover it immediately with a thick compress, kept in its place by an assistant. It is requisite that the piece of linen employed should not be larger than the dimensions above indicated, because the rubefacient action of the medicine extends over a surface much greater than that of the linen which is used. A quarter of an hour after the application I remove the entire apparatus; the skin is then of a light rose colour, and if the cerebral disease will have a favourable termination, it becomes, after a longer or shorter time, tense, very red, painful, and often covered with phlyctenæ. The application to the surface of these parts of compresses soaked in a solution of chloruret of soda, such as is employed in cases of very painful burns of the first degree will be sufficient to relieve the pain.

Vermifuges: Anti-psorics.—*Anthelmintic Potion* (F. H. Lyon).—Two drachms of powdered semen contra, thirty grammes of peach-flowers, 150 grammes of lettuce-water.

Vermifuge Syrup (Cruveilhier).—Five grammes of senna, five grammes of rhubarb, five grammes of semen contra, five grammes of Corsican moss, five grammes of tansy, five grammes of the small wormwood (artemisia pontica), and five grammes of artemisia absinthium, infused in a sufficient quantity of water to yield 250 grammes when strained, in which 500 grammes of sugar are to be dissolved at a gentle heat and strained. The dose is a teaspoonful every morning.

Pills against Lumbrici and Ascarides (Pitschaft).—Five grammes of powdered semen contra, five grammes of extract of wormwood; to be made into pills weighing two grains each, and rolled in the carbonate of magnesia; four to be taken every two hours. In cases of little children, who are too young to take this medicine in the form of pill, M. Pitschaft directs the use of an aqueous infusion of semen-contra and the chenopodium of Mexico. He is also of opinion that the aqueous decoction of quicksilver, (simple mercurial water) is a preparation not to be despised by practitioners, and which may prove of considerable service in these last-named cases. If, during or after the use of this plan of treatment, a purgative is necessary, he prefers castor oil, because it acts against intestinal worms.

Vermifuge Liniment of Pétrequin.—Thirty-two grammes of castor-oil, fifteen grammes of oil of wormwood, fifteen grammes of the oil of tansy, twenty drops of Dr. Preschier's ethereal tincture of the buds of the male fern. This liniment is used in frictions on the abdomen; in urgent cases it may be rendered more active by macerating a little sliced garlic in the oil of tansy.

Santonine (Mialhe).—The semen-contra contains two principles which appear equally efficacious in destroying lumbrici, namely, the volatile oil and santonine. The latter substance should be preferred because it is insipid. It is obtained in the following manner, according to M. Calloud:—Thirty grammes of the semen-contra are placed in a large cauldron with a sufficient quantity of water, and heat is applied; when it is boiling, a sufficient quantity of milk of lime is added to saturate the santonine, and fix, at the same time, the greater part of the colouring matter. The product is then submitted to the action of the press, the residuum is replaced in the cauldron, and exhausted by a fresh quantity of hot water; it is again pressed, the decoctions mixed together, and allowed to deposit, after which it is decanted, and evaporated in a very wide pan to a certain degree of concentration; it is then clarified and filtered. The liquid is then again placed on a fire and evaporated, after which it is poured into a large freestone pan, and a slight excess of hydrochloric acid added. After having been set aside for twenty-four hours, the santonine is found in a state of greater or less purity. It is washed with weak alcohol to remove the greater part of the fatty resinoid matter;

the deposit is pressed, treated with boiling alcohol and charcoal, and set to crystallize.

Santonine Lozenges (Calloud).—Four grammes of santonine, 150 grammes of sugar, and two grammes of gum tragacanth, made into forty-four pastiles. From five to ten daily may be given to little children.

On the Employment of Anthelmintics in Young Persons (Trousseau).—Many practitioners in Paris do not believe in the injurious influence of intestinal worms, which incredulity M. Trousseau explains in the following manner :—Whether it be owing to the effects of a difference in diet, or whether it depend on other conditions which are not fully appreciated, Parisian children are much less subject to the accidents caused by intestinal worms than are those resident in the provinces. M. Trousseau regards these parasites as a frequent cause of the diseases of infancy. One of the most serious consequences of their presence is convulsions; they are not induced by the direct action of the worms on the intestinal mucous membrane, but by the gastric symptoms to which their presence in the digestive apparatus may give rise. Children troubled with worms present a great paleness of the countenance; their pupils are dilated, they have itching at the nose, and they are more irascible. All these are nervous phenomena of which the presence of worms is an occasional cause. Children thus affected, in consequence of disordered digestion, frequently fall into a very severe state of cachexia, which may bring on pulmonary symptoms, to which they almost always fall victims. If, under these circumstances, vermifuges—such as calomel, the infusion of Corsican moss, or of semen-contra, &c.—be given, the expulsion of the intestinal worms will be effected, the digestive functions will be restored, nutrition will be healthily carried on, the cachectic symptoms will consequently disappear, and a complete restoration of the health will follow. It is the more important to be aware of the class of symptoms which the presence of worms in the intestines may produce, as vermifuges may then be employed empirically yet successfully in cases where no appreciable cause could explain the symptoms which are discovered, and this plan of treatment may be had recourse to with more security, as the Corsican moss, the semen-contra, wormwood, the filix mas, &c., may be administered without inconvenience.

Treatment of Tænia by the Etherial Oil of the Filix, according to the Method of Coindet.—The patient must take very rich soups and broths for several days before the exhibition of the pills, which he should take in two doses, one at bedtime and the other the next day. Two grammes and a half of the etherial oil of the filix mas, two grammes and a half of calomel, prepared by steam, and a sufficient quantity of fresh powdered filix to make a mass, which is to divided into six grain pills. The patient should take sixty grammes of castor oil two hours after the second dose, and he will pass the worm entire soon afterwards.

Comparison of the Action of the Pomegranate Bark and the Filix Mas (Marinus).—The following are the conclusions at which M. Marinus arrives: —1st. The root of the filix mas, in powder and in extract, acts equally efficaciously in the botriocephalus, which is expelled in portions, but has only an uncertain action on the armed tænia. Employed in these cases against this species of entozoa, according to Mad. Nouffer's method, it has only produced the expulsion of some portions of worm, and it became necessary, some days afterwards, to have recourse to the exhibition of the bark of the pomegranate root, and with success. 2nd. The bark of the wild pomegranate root is indeed a certain specific, which destroys the tænia, of whatever species it may be, without affecting the stomach or intestines. Used in a great number of cases of persons of both sexes and of all ages, this medicine has generally afforded the most advantageous results, and its innocuousness, notwithstanding what has been said, is so well established, that in one case an adult took, in a single day, two doses of the decoction of the bark without experiencing the slightest inconvenience. Its employment in the cases of children, in the dose of from thirty to sixty grammes, has not produced any unpleasant symptoms whatever. Dr. Marinus concludes by declaring that the superiority of this agent over the filix mas appears to him to be incontestibly proved.

Tæniafuge Treatment (Schmidt).—The following is the detail of this extraordinary treatment, of which the Prussian government has purchased the secret:—Two teaspoonsful of the following purging mixture are given every two hours from the morning to seven in the evening:—Twenty-four grammes of powdered valerian, eight grammes of senna-leaves, 200 grammes of boiling water, infused in a close vessel until it becomes cool, then strained, and twelve grammes of crystallised sulphate of soda, sixty grammes of syrup of manna, eight grammes of the oleo-saccharum of tansy added to the strained liquid. The patient, in the intervals of the doses, is to drink very freely of coffee made with water and much sweetened; at noon he should have a light soup, a little herring and whiting, and at eight in the evening he may eat a salad made with herring, raw ham chopped up, an onion, oil, and sugar in abundance. The next day the patient is to take every hour, commencing at six in the morning, six of the following pills in a coffeespoonful of simple syrup :—Twelve grammes of assafœtida, twelve grammes of extract of dandelion, eight grammes of gamboge, eight grammes of powdered rhubarb, eight grammes of powdered jalap, twelve grains of powdered ipecacuanha, twelve grains of powdered digitalis, twelve grains of the golden sulphuret of antimony, forty-eight grains of calomel, fifteen drops of the volatile oil of tansy, and fifteen drops of the volatile oil of aniseed, mixed together, and made into a perfectly homogeneous mass, to be divided into pills weighing two grains each, which are to be rolled in lycopodium powder, and then put into a glass vessel, carefully stoppered. Half an hour after the first dose of these pills, a teaspoonful of castor oil is given, and the patient must drink a large quantity of coffee, made with water and well sweetened, in the course of the day. In the greater number of cases the worm is expelled about two in the afternoon; if not, the patient must continue the use of the pills, and take, from time to time, a spoonful of castor oil with sugar, until fragments of tænia no longer come away. The patient may have some broth that day about noon, and in the evening some soup made with flour, butter, and sugar. For several days afterwards, as a mere measure of precaution, the patient should take one or two of these pills.

Kwoseine (Stanislas—Martin).—The kwoso has been mentioned in one of the preceding Annuaires, where, on the authority of Messrs. Abbadie and Aubert, it is described as an excellent vermifuge. M. St. Martin has succeeded in isolating a crystalline principle by the following process :—250 grammes of finely-powdered flowers of kwoso, and a sufficient quantity of alcohol at 36°, macerated for a fortnight; the tincture is then poured off, and its place supplied by cold distilled water, which is to be renewed until it is no longer charged with soluble principles. The tincture is then distilled, in order not to lose the spirit, and the residue of the distillation is mixed with the aqueous infusions, previously strained; the mixture is evaporated in a water bath to the consistence of a dry extract, which is next dissolved in a sufficient quantity of cold distilled water, and again filtered. The precipitate is washed with alcoholised water. When the precipitate is dry, it is treated with boiling alcohol at 36°, which is afterwards evaporated at a gentle temperature. The crystals are dried between two leaves of Joseph paper, and, if they are not white enough, they should be treated with vegetable charcoal.

On certain new Treatments for the Itch.—The ointments, pommades, and liniments which have been recommended from time to time against the itch are exceedingly numerous. Some have been rejected for uncertainty of action, and the most efficacious having the serious inconvenience of soiling the whole body and the linen. M. Dornblueth has recently published a new formula, which, like many others, has given excellent results; but it is reserved for the country practitioners to decide whether it can replace the popular sulphur ointment. This formula is as follows :—

Lotion against the Itch (Dornblueth).—One hundred and twenty-five grammes of black soap, sixty grammes of the powdered root of white hellebore, and a sufficient quantity of hot spring water to bring it to the consistence of syrup. This liniment is applied with the palm of the hand, or with a brush, sufficient force being used in employing it, over all the parts of the body which present the slightest trace of exanthema, especially upon the articulations of the four limbs, on the haunches, and on the abdomen. The force with which the friction is used must be proportioned to the sensibility of the skin. As soon as the parts which are rubbed, begin, after the first, second, third, and fourth application, to become red, and to have a sensation of burning, instead of the itching which was previously felt, and no fresh pimples are seen to arise, the use of the liniment may be omitted. The day after the last friction the whole body should be rubbed over with 125 grammes of black soap, and afterwards carefully washed with a quantity of hot water, holding in solution the same amount of black soap. All that is requisite afterwards is to put on clean linen and new clothes, as the old ones must be washed and disinfected by the gazeous sulphurous acid before they can be used again.

This treatment for the itch is certain, and economical; the black soap cleanses well the skin, and the active principle of the white hellebore kills the acarus, but the use of so active a substance may sometimes lead to inconvenient results. As the cause of the itch is now well known, it is easy to choose remedies which will certainly destroy the acarus, and yet not be dangerous to man. M. Aubè has shewn that a general friction with the oil of turpentine is sometimes sufficient to destroy all parasites, and effect a perfect cure. M. Cazenave has lately recommended the solution of the ioduret of sulphur in the ioduret of potassium;* this skilful practitioner has also shewn that aromatic lotions, with hydro-alcoholic solutions of the essential oils speedily cure the itch, without producing any unpleasant consequences. Among all the essential oils, that which appears to M. Bouchardat the most energetic in the destruction of the inferior animals is that of aniseed, afterwards which ranks that of peppermint.

On Porrigo Decalvans, or Phyto-Alopecia (Gruby).—On examining, says M. Gruby, under the microscope, the white powder which covers the skin in porrigo decalvans, we shall be astonished to find it entirely composed of cryptogamic plants, which surround the hairs on all sides, and constitute a perfect vegetable sheath from their origin in the skin to a distance of from one to three millimetres. The examination of this sheath in the microscope will shew its true vegetable composition. The cryptogamic plants are admirably arranged so as to constitute a tube or solid vegetable sheath around each hair. They are composed of bunches, stems, and sporules. They multiply with great rapidity. It is sufficient that a single point of skin be affected, in order that in a few days a patch of three or four centimetres be covered with them. If we admit, with M. Gruby, that porrigo decalvans is caused by the presence of a parasite, nothing will be more easy than to prevent this powerful cause of alopecia. Very weak mercurial lotions (water for example, containing a thousandth part of the double ioduret of mercury and potassium), or aromatic lotions (two grammes of essence of aniseed, ten grammes of

* M. Soubeiran has shown that the ioduret of potassium does not dissolve the ioduret of sulphur, but merely deprives it of its iodine. The solution which is employed, therefore, by M. Cazenave, consists solely of an ioduretted solution of the ioduret of potassium, which may be thus prepared:—five grammes of the ioduret of potassium, three grammes of iodine, a quart of water. M. Bouchardat has seen a similar solution exert a rapid and energetic toxic action on inferior animals, whence he deduces its efficacy in the treatment of itch.

alcohol, and one hundred grammes of water) will be sufficient, M. Bouchardat says, to destroy these parasitic plants.

Aromatic Pommade (Cazenave). — Thirty grammes of beef marrow, four grammes of aromatic tincture, mixed together, and employed in inunction in porrigo decalvans. The diseased patches should be washed evening and morning with salt water before applying the ointment.

On a Species of Contagious Mentagra, resulting from the development of a new Cryptogamic Plant in the Roots of the Human Beard. (M. Gruby).—The species of mentagra in question has its seat in the hairy part of the face; it most commonly occupies the chin, the upper lip, and the cheeks; it covers all these parts with white, grey, and yellowish scales, from two to six millimetres wide, and three to eight long. They are rather convex in the middle; their edges are angular, slightly depressed, and traversed everywhere by hairs; they are but slightly attached to the subjacent skin, but adhere strongly to the hairs. On examination under the microscope, they are found to consist only of the cellules of the epidermis; but the microscopic examination of the hairs shews that its dermatic part is surrounded by cryptogamic plants, forming a vegetable layer between the sheath of the hair, and the hair itself, so that the hair is enclosed in a sheath formed exclusively of cryptogamic plants, like a finger in a glove. But it is remarkable that these cryptogamic plants never pass beyond the surface of the cutaneous epidermis; they take their origin in the matrix of the hair, and in the cells of which its sheath is compressed, and they ascend to envelope the part of the hair which is covered with the skin; they are found with an innumerable quantity of the sporules adhering on the one hand to the internal surface of the sheath of the hair, and on the other to the hair itself; they are so attached to the sheath that it is difficult to separate them without tearing them. With the exception of these cryptogamic plants, there is not found any pathological products, neither globules of pus nor inflammatory globules. The cells of the sheath of the hair preserve their transparency and normal form; they are less adherent among themselves, that is to say, they can be more easily separated from each other than in their physiological condition.

The three species of cryptogamic plants of tinea favosa, aphthæ, and mentagra can be readily distinguished by the following characters:—In the porrigophytes (cryptogamic plants of tinea favosa), 1st, the cryptogamic plants are lodged in the cells of the epidermis; 2ndly, they descend upon the follicles of the hair; 3rdly, they are enclosed in proper capsules; 4thly, they very rarely have any granules on their stems; and 5thly, their sporules are generally oval. In the mentagrophytes (cryptogamic plants of mentagra), 1st, the cryptogamic plants are located between the hair and its sheath; 2ndly, they ascend from the root of the hair to the epidermis; 3rdly, they have not any capsules; 4thly, they have almost always sporules in their stems; and, 5thly, their sporules are small and generally round. In the aphthaphytes (cryptogamic plants of aphthæ), 1st, the cryptogamic plants are lodged between the cells of the epithelium; 2ndly, they form mushrooms; 3rdly, their branches are detached from the stem at acute angles; 4thly, their branches are rarely striated. In the mentagrophytes, 1st, the cryptogamic plants are lodged in the sheaths of the hair; 2ndly, they do not form mushrooms; 3rdly, their branches are detached at angles from 40° to 80°; and, 4thly, their branches are always striated.

A slight recent attack of mentagra always yields in a few days to diluent drinks, cataplasms, and emollient lotions; but, when it is very severe, it demands energetic treatment. The following is the plan of treatment now pursued by M. Emery, after numerous experiments; it is simple, easy of execution, and is fortified by the experience of eighty cases, seventy-four men, and six women:—He begins by cutting away the beard with scissors, cleansing the diseased parts, and covering them with thick poultices of potatoe-starch placed between two pieces of linen, and which are to be renewed four or five times in the twenty-four hours. He also prescribes marshmallow-water lotions, and local baths of the same kind. After eight days' treatment, the lotions and baths are replaced by alkaline lotions, four grammes of the subcarbonate of potash in a quart of water; they are employed at first four or five times a-day, for ten minutes at a time; the time employed is afterwards increased, and at last two or three hours a-day may be occupied in this medication. The application of emollient poultices may be continued for a fortnight or three weeks longer. M. Gruby at first suspends their use during the day, and finally, after a month or five weeks, according to the state of the pustules, he abandons them altogether, and uses only the alkaline lotions, the action of which is aided by alkaline douches and vapour baths. He gives as ptisan an infusion of scabiosa and of wild pansy, or that of fumitory and dulcamara. Gentle saline purgatives are also given several times during the course of the disease; the waters of Enghien internally, a mild diet and simple baths complete the treatment, which is continued for a month or six weeks.

Of the Nature and Treatment of Aphthæ —muguet.—Next to the induration of the cellular tissue, the disease which carries off the greatest number of newly-born children in the foundling hospitals is thrush. Hitherto we have been entirely ignorant of the cause and nature of this serious disease. The greater number of pathologists saw in aphthæ only a pseudo-membranous production consecutive on an idiopathic inflammation. With others it was a symptomatic inflammation. Neither were medical men agreed as to its mode of transmission; some regarded it as contagious, while others formally denied that it was so. According to the researches of M. Gruby, thrush is produced by the development of a cryptogamic plant.

Aphthæ present themselves in the form of white masses, covering the whole of the mucous membrane of the mouth, and extending sometimes into the pharynx, œsophagus, stomach, and small intestines. The commencement of the disease is characterised by small, conical, whitish elevations, twenty-five millimetres in diameter, dispersed over the mucous membrane of the mouth; these elevations soon increase in size, and extend rapidly in the form of a pseudo-membrane strongly adherent to the subjacent tissue, from two to three millimetres thick, and covering sometimes the whole extent of the alimentary canal. A portion of this substance, examined under the microscope, is found to be wholly composed of a collection of cryptogamic plants. The roots are implanted in the cellules of the epithelium; they are cylindrical, transparent, and about 1-480th of a millimetre in diameter; during the development they perforate the entire series of cellules which compose the epithelium, to arrive at the free surface of the mucous membrane. The stems, which spring from the surface of the epithelium, are equally transparent, are divided at certain distances by septa, and contain corpuscles in their interior; they are cylindrical, straight, about one-fourth of a millimetre in length, and 1-400th of a millimetre in width; the stems are divided into branches, which are again subdivided, bifurcating at an acute angle. These branches are composed of very distinct oblong cellules, containing one, two, or three round and transparent nuclei; their lateral parts have sporules here and there, and their ends especially have a great number. The diameter of these sporules is from 1-200th to 1-500th of a millimetre.

These cryptogamic plants have considerable analogy with the sporotrichium, described by some botanists. As they are very fragile, they become detached by the movements of the organs lined by the mucous membrane, and becoming mingled with the food, are carried into the alimentary canal, of which they afterwards cover a considerable extent. Those children in whom this extension of disease takes place very largely, fall into marasmus, and soon die. As M. Gruby has constantly found in the white substance of aphthæ only these plants and the cellules of the epithelium, and never any production of inflammation, he deems himself authorised to conclude that thrush is nothing else than a cryptogamic plant vegetating on the living mucous membrane.

Treatment of Thrush (Trousseau).—M. Trousseau employs the following collutory successfully in the treatment of thrush:—One gramme of hydrochloric acid, ten grammes of honey. He also recommends the following application:—Equal parts of finely-powdered borax and honey, mixed together.

Dentifrices.—*On the Vibriones of Tartar and the Mucous Layers of the Tongue and Teeth* (Mandl).—If we take, says M. Mandl, a quantity of the mucosities which collect on and between the teeth, and dilute it with a drop of distilled water, previously heated, we may perceive, with the assistance of a power magnifying from four to five hundred times, a mass of infusoriæ, moving about with great activity, their size varying from 1-500th of a millimetre to that of several hundredths of a millimetre. Their form is identical with that of the infusoriæ which authors describe under the name of vibriones, and it is very analogous to that of the stick vibriones (vibroios bagnettes). These infusoriæ exist in great numbers in patients who have been on low diet for several days. They constitute also the greater part of the mucous layers of the tongue in persons whose digestion is out of order.

If a portion of the concrete tartar is softened in a drop of water for twenty or thirty minutes, and then compressed between two glasses, it will be seen distinctly that it consists of dead vibriones, of different sizes, but the most frequently of several hundredths of a millimetre in length, united together by an organic matter (dried mucus), the quantity present of which is very variable; it often, too, appears that the tartar is composed almost entirely of these vibriones. It results, therefore, from these observations, that the vibriones are provided with a carapace, or inorganic (calcareous) skeleton, since the tartar, which is composed of calcareous salts, is formed principally of the remains of these vibriones. Tartar, as is well known, tends continually by its accumulation to loosen the teeth. This inconvenience may be certainly prevented by very frequent lotions with a very aromatised water, containing an essence which will destroy the vitality of these vibriones. Several formulæ for these aromatic tinctures are published in M. Bouchardat's *Formulaire*. The best is that known by the name of *eau de Botot*.

Dentifrice Elixir (Désirabode).—One hundred and eighty-seven grammes of guaiacum brandy, 187 grammes of spirituous vulnerary water, four drops of essential oil of mint, clove, or pink. Two or three drops are sufficient to aromatise a glassful of water; it is especially suited for persons whose mouth is healthy, but those whose gums are constantly bleeding, or who have foul breath, had better use the following preparation in the same manner.

Dentifrice Elixir (Désirabode).—Two hundred grammes of guaiacum brandy, four grammes of camphorated spirit, six drops of essence of mint, six drops of essence of horseradish, six drops of essence of rosemary.

Tonic Dentifrice Elixir (Désirabode).—One hundred and twenty grammes of rhatany root, two quarts of spirituous vulnerary water, four grammes of essential oil of mint, six grammes of the oil of orange-peel. The rhatany root is to be bruised, and infused in the vulnerary water for eight days; the tincture is then to be filtered, and the essences added, having been previously dissolved in twenty four grammes of alcohol.

Prodhome's Dentifrice Water.—Two hundred and fifty grammes of angelica root, 250 grammes of aniseed, sixty grammes of cinnamon, sixty grammes of nutmeg, sixty grammes of cloves; all these substances are to be bruised, and then introduced into a retort, to which is added eight kilogrammes of alcohol at 25°, and ninety grammes of English essence of mint. They are allowed to macerate for a week, and then distilled in a water bath until no more liquid passes over. The spirit which is thus obtained is then placed in contact with the following substances, previously coarsely powdered:—Sixty grammes of red cinchona bark, sixty grammes of rhatany root, sixty grammes of balsam of Tolu, to which is added thirty grammes

of tineture of vanilla, and thirty grammes of powdered eochineal. The whole is set aside to macerate for six days, then filtered, and preserved for use. The dose is from fifteen to twenty drops in a glassful of water, to rinee the mouth with in the morning.

Odontalgic Water (O'Meara, *expired patent*).—Four grammes of the vetiver of India, sixteen grammes of pyrethrum root, six grains of English cloves, twelve grains of the iris Florentina, twelve grains of eoriander seeds, twelve grains of anehusa root, twelve drops of English essence of mint, six drops of essenee of bergamott, sixty-four grammes of alcohol at 36°. The solid substanees are bruised, put into a well-stoppered bottle, the spirit of wine and essenees added, and all maeerated together for eight days, the vessel being shaken from time to time. The liquid is then filtered, and put into little bottles. The residue, redueed to powder, is burned, aeeording to M. Pasquier, and the ashes used as a dentifriee powder, having been previously aromatised with an essenee.

This water was patented on the 31st of July, 1837, when twelve drops of ereosote were added to every thirty grammes of the filtered liquid, and the essence of mint and bergamott were replaced by the same quantity of essenee of aniseed and lemon; and, in aeeordanee with the request of medieal men and purehasers, the colour caused by the anehusa was changed for a green one produeed by some inert plant.

Odontalgic Mixture (Oudet).—Two grammes of aeetic ether, two grammes of Sydenham's laudanum, two grammes of essenee of eloves. A pieee of cotton moistened with this liquid should be plaeed in the decayed tooth.

Dentifrice Elixir (Berton). — Twenty-four grammes of essenee of mint, ten grammes of essenee of cinnamon, twelve grammes of essence of aniseed, twelve grammes of essence of cloves, 500 grammes of tincture of guaiaeum, five quarts and a half of aleohol at 22 deg.

English Dentifrice Powder.—Three grammes of dried chalk, one gramme of camphor, mixed together, and preserved in a bottle.

Dentifrice Powder (Kemmerer). — Thirty grammes of porphyrised powdered wood-soot, twenty grammes of powdered strawberry wood, and a few drops of eau de Cologne. *** According to the author, this powder whitens and preserves the teeth.

Dentifrice Powder (Regnard). — Fifteen grammes of caleined magnesia, ten grains of sulphate of quinine, two grammes of fine carmine, or eochineal, three drops of the volatile oil of peppermint.

Cosmetics.—*Aromatic Mixture* (Landerer).—One hundred grammes of laurel leaves, ten grammes of cloves, 150 grammes of spirit of lavender, 150 grammes of spirit of thyme, digested together for ten days, filtered, and fifteen grammes of sulphuric ether added. *** This tineture, it is said, has been employed sueeessfully in promoting the growth of the hair.

Ointment for the Hair (Boueheron; *expired patent*).—Thirty-one grammes of Castile soap, thirty-one grammes of leather ashes, thirty-one grammes of mineral salt, thirty-one grammes of red tartar, thirty-one grammes of dusting powder (*poudre à poudrer*), eight grammes of sulphate of iron, eight grammes of sal ammoniac, eight grammes of coloeynth, eight grammes of cateehu. All these substances are aecurately mixed together, having been previously combined with a sufficient quantity of lard, to make an ointment for the hair; a cap of taffeta is to be anointed with this composition.

Ointment for the Hair (Huart; *expired patent*).—Five hundred grammes of saturated ointment of orris-root, 500 grammes of saturated ointment of pinks, 500 grammes of saturated ointment of Ceylon cinnamon, 500 grammes of saturated ointment of camphorated mint-leaves, sixteen grammes of white oxide of tartarised antimony, sixteen grammes of essence of thyme, sixteen grammes of essence of sage. The orris-root sliced, the cinnamon, and the pink-petals and mint-leaves bruised, are introduced into a vessel whieh can be closed hermetieally; the lard is melted at a gentle heat, whieh is afterwards raised, and when it is almost boiling it is poured upon these substanees, and left in eontaet with them for a fortnight, the vessel being closed. At the end of that time it is again melted, pressed, and filtered through a pieee of close linen; the oxide, previously reduced to an impalpable powder, is then ineorporated with the ointment, and after that the essenees are mixed with it by trituration.

Macassar Oil (Hènkenius). — Ninety-six grammes of the oil of turmerie seeds, obtained by cold expression, sixteen grammes of liquid goose-fat, eight grammes of liquid storax, eight grammes of oil of eggs, eight grammes of genuine essenee of thyme, eight grammes of eaeao butter, four grammes of essential oil of orange flowers (nèroli) four grammes of essenee of roses, twelve grains of blaek balsam of Peru. The whole is set aside to elarify by rest in a moderately warm situation, and the limpid produet is afterwards preserved in a eool plaee.

Kleist's Powder for Fumigations in the Rooms of Scorbutic Patients.—One hundred and eighty grammes of the bisulphate of potash, fifty grammes of aeetate of lead, 250 grammes of the binoxide of manganese. Thesc three substanees, in powder, are to be mixed together when required, and spread out on plates in the room to be fumigated.

Ambroise's Paste for Dyeing the Hair Black.—One hundred and twenty grammes of powdered quiek lime, eighty grammes of powdered litharge, 280 grammes of infusion of sage. The paste madc with these substanecs is applied for four or five hours on the hair, whieh should be previously washed with a solution of alum. When it is removed, the hair is again to be washed with bran water. *** This mixture communieates a black tint to the hair from the sulphur it contains.

ON THE SULPHITES.

BY DR. JAMES SHERIDAN MUSPRATT, OF LIVERPOOL.

[For the Medical Times.]

(Continued from page 39.)

SULPHITE OF LEAD.

This salt is deposited as a white amorphous powder, when sulphite of soda or potash, &c., is added to the nitrate of lead. When sulphurous aeid is passed through the peroxide of lead, it is absorbed with great avidity, and sulphate of lead is produced. The sulphite of lead is insoluble in water, and very sparingly soluble in aqueous sulphurous acid; it is anhydrous, and tasteless. At the request of Professor Liebig, I tried the action of sulphurous acid upon the sulphuret of lead, and found that a hyposulphite was formed, whieh was aecompanied by some free sulphur. This decomposition may be represented by the following equation:—

$$2\ Pb\ S + 3\ SO_2 \text{ giving } 2\ (Pb\ O\ .\ S_2\ O_2) + S.$$

When the sulphite of lead is heated, sulphurous aeid eseapes, and sulphate, sulphuret, and some oxide remain, as expressed in the annexed formula:—

$$5\ (Pb\ O\ .\ SO_2) \text{ giving } SO_2 \text{ and } 3\ (Pb\ O\ .\ SO_3) + Pb\ S + Pb\ O$$

SULPHITE OF TIN.

The aetion of sulphurous aeid upon tin has been mentioned in the introduetion to this paper; it was also studied by Fourcroy and Vauquelin, who found, that, when a plate of tin was immersed in aqueous sulphurous aeid, it assumed a yellowish colour, and a blaek powder preeipitated, which was sulphuret of tin. I have not studied this aetion, and, therefore, cannot advert to the composition of the sulphite, which is also produeed during the above-mentioned reaetion.

SULPHITES OF THE SUBOXIDE OF COPPER.

When sulphate of eopper is boiled with a weak solution of sulphite of potash, or when sulphurous aeid is passed through water eontaining carbonate or oxide of copper in suspension, a beautiful ruby-eoloured salt is deposited, in the form of oblique rhombic prisms. These three decompositions may be represented by the following equations:—

I.—$2\ (Cu\ O\ .\ SO_3) + 3\ (KO\ .\ SO_2$ (giving $(Cu_2\ O\ .\ SO_2)$ and $3\ (KO\ .\ SO_3) + SO_2$

II.—$3\ (Cu\ O\ .\ CO_2\ .\ Cu\ O\ .\ HO) + 4\ SO_2$ giving $2\ (Cu_2\ O\ .\ SO_2)$ and $2\ (Cu\ O\ .\ SO_3) + 3\ (HO\ .\ CO_2)$

III.—$3\ (Cu\ O) + 2\ SO_2$ giving $(Cu\ O\ .\ SO_2) + (Cu\ O\ .\ SO_3)$

By the addition of absolute aleohol to any of the above solutions, a brownish-yellow preeipitate is oeeasioned, which, by boiling, beeomes red and erystalline. If sulphurous acid be passed into water containing a little oxide of copper, diffused through it, and the resulting liquid, whieh is of a beautiful nickel-green colour, allowed to evaporate on a sand-bath for some days, the sulphite is obtained in large, fine, purplish erystals, which are red when reduced to powder.

When this salt is boiled with water for a time, nearly the whole of its aeid is separated, and the suboxide of eopper which remains is of a brighter colour than when in eombination. On exposure to heat in a crueible, it is deeomposed, sulphurous acid, and some sulphur is expelled, and the residuum eonsists prineipally of sulphate and sulphuret of eopper.

Analysis of this Salt.

1·347 grm. salt preeipitated by eaustie potash, gave:
·476 grm. oxide of eopper.
2·377 grm. salt, treated with nitric aeid, &e., gave:
2·463 grm. sulphate of barytes; and
1·466 grm. salt, ignited with ehromate of lead, gave:
·119 grm. water.

From the above is dedueed the formula: $Cu_2\ O\ .\ SO_2 + HO$, which I annex in per eents.

Composition in per Cents.

	Theory.	Found.
1 eq. sulphurous acid	401·17 . 28·56 .	28·51
1 eq. suboxide of copper	891·40 . 63·43 .	63·35
1 eq. water	112·5 . 8·01 .	8·11
Loss		00·03
	1405·07 100·00	100·00

This salt is aualogous and isomorphous with the blue carbonate of copper (azure copper ore), whieh has been analysed by Klaproth, and the formula dedueed from his numerieal is the following:—

$$Cu_2\ O\ .\ CO_2 + HO$$

Chevreul has previously investigated the sulphited suboxide of copper, but the following formula, whieh has been inferred from his analysis, I think highly improbable:—

$$4\ Cu_2\ O\ .\ 5\ SO_2 + 5\ HO$$

I obtained, by the addition of sulphite of potash to a rather strong solution of nitrate (or sulphate) of copper, a yellowish preeipitate, the composition of whieh is represented by Berzelius and Graham, in the following formula:—

$$2\ (KO\ .\ SO_2) + Cu_2\ O\ .\ SO_2$$

When this salt is boiled with water, the whole of the sulphite of potash is removed, and the red sulphite of copper remains behind. Should the boiling be kept up for some minutes, the residuum only consists of pure suboxide of copper.

I find that sulphuret of eopper was not at all affeeted when played upon by a stream of sulphurous aeid gas.

SULPHITE OF BISMUTH.

The sulphite of bismuth is formed when sulphurous acid gas is transmitted through the nitrate. It is insoluble in water, and also in an exeess of the acid. It possesses a disagreeable taste, and, when heated, parts with the whole of its aeid. I have not analysed it.

SULPHITE OF SILVER.

This salt is very readily prepared, by adding, eautiously, sulphurous aeid water to a solution of nitrate of silver. It preeipitates (exactly like the ehloride) in small, shining, white grains, which are very slightly soluble in water, but are decomposed when an exeess of the preeipitant is added. They possess a disagreeable metallic taste, and, when exposed to the light for some time, assume a dark purplish, and, ultimately, blaek eolour.

When heated in a crucible, below redness, sulphurous acid escapes, and some sulphate of silver is formed, which only parts with the *whole* of its sulphuric acid and oxygen at a bright red heat.

Analysis of this Sulphite.

I.

2·460 grm. salt, heated to redness, gave:
1·811 grm. metallic silver = 1·944 oxide.
2·460 grm., therefore, lost:
·649 sulphurous acid and oxygen = ·520 sulphurous acid.

II.

1·790 grm. salt, treated with nitric acid, &c., gave:
1·720 grm. chloride of silver = 1·392 oxide of silver.

From the above numerical results, is deduced the formula, Ag O , SO_2, which I subjoin in per cents:—

	Theory.	Found. I.	Found. II.	Mean
1 eq. sulphurous acid	401·17	21·165	21·14	——
1 eq. oxide of silver	1451·60	78·35	79·02	77·76 78·39
	1852·77	100·00	100·16	.. ..

The corresponding carbonate precipitates as a white, sparingly soluble, powder, when carbonate of soda is added to the nitrate of silver. It dissolves readily in nitric acid, and is anhydrous.—Formula: Ag O . CO_2

The sulphite of silver dissolves in aqueous solutions of sulphites of soda, potash, and ammonia, but the donble salts formed are exceedingly unstable, and on this account I have not as yet analysed any of them.

SULPHITES OF PLATINUM.

When sulphurous acid gas is passed through water, containing in suspension very minutely divided metallic platinum, no action takes place; but if the gas be conducted through the bichloride of platinum, it is very slowly decoloured, and, when treated with carbonate of soda, &c., gives colourless double compounds. These salts I have not further investigated, as some of them have been previously procured by chemists, whom I shall subsequently name, and are now under very excellent hands (Dr. Peÿrone) in the Giessen Laboratory.

Litton and Schnederman* obtained two double sulphites of platinum and soda, the first of which is white, by saturating with carbonate of soda the bichloride of platinum, charged with sulphurous acid, or by treating the sulphite of platinum with the carbonate; and the second, which is yellow, by digesting the first compound in weak sulphuric or hydrochloric acid. The following is the formula of their salts:—

$$2\,(3\,Na\,O\,.\,SO_2 + Pt\,O\,.\,SO_2) + 3\,HO$$
$$Na\,O\,.\,SO_2 + Pt\,O\,,\,SO_2 + HO$$

The constitution of the above compounds is very remarkable, and their behaviour, &c., which is well worthy of perusal, will be found in the interesting paper of the previously-named chemists.

The sulphite of platinum and ammonia, which has been analysed by Böckman,† falls in a crystalline state when absolute alcohol is added to the bichloride of platinum, saturated with sulphurous acid, and neutralised by ammonia.

Böckmann's results agree with the annexed formula:—

$$Pt\,O\,.\,SO^2 + NH^4\,O\,.\,SO_2$$

Döbereiner has obtained a sulphite of the peroxide of platinum. In his treatise‡ he remarks that the peroxide of platinum, which is with great difficulty soluble in most acids, forms a sulphite with the sulphurous acid. The properties of the sulphite are so remarkable that I have abridged the following from his results:—

I.—The sulphited solution dries to a gummy mass, which is perfectly colourless, and readily soluble in water and alcohol.

II.—It is very acid, and is not changed when exposed to the air.

III.—At a high temperature, it is decomposed into sulphurie acid and metallic platinum.

IV.—Protochloride of tin colours it decp red, and large quantities of sulphurous acid are eliminated.

V.—It is neither decomposed by hydrochloric or sulphuric acid.

VI.—When mixed with chloride of gold, it is resolved into chloride of platinum and sulphuric acid, with deposition of metallic gold.

Formula: $Pt\,O_2 + 2\,SO_2$ or $Pt\,S_2\,O_6$

I have been engaged with the sulphites of platinum for some time, but as yet have not obtained results which would be of much importance. I am at present examining the above-mentioned salt, in order to study more particnlarly the double compounds which it forms with potash, soda, ammonia, &c.

SULPHITE OF ANTIMONY.

This salt may be procured by digesting protoxide of antimony in aqueous sulphurous acid, or by passing a stream of the gas through a solution of the chloride. It is insoluble in water.—*Berzelius.*

SULPHITE OF CHROMIUM.

I found that oxide of chromium readily dissolved in sulphurous acid, and deposited a whitish green powder when treated with alcohol, or when slightly heated. This precipitate possessed a disagreeable sulphurous taste, and, when heated, parted with large portions of sulphurous acid. Berthier found that, when sulphurous acid was conducted through a solution of neutral chromate of potash, a considerable brown deposit was formed, which quickly turned green, and gradually dissolved, producing a greenish liquor, which contained sulphuric, hyposulphuric, and sulphurous acids. When the solution was boiled, sulphurous acid escaped, and nearly the whole of the chromium was precipitated in the state of subsulphite.

SULPHITES OF URANIUM.

Rammelsberg, who has lately published a very interesting paper upon the various salts of uranium,* gives the analysis of a sulphite of the protoxide of uranium, which he obtained by adding neutral sulphite of soda to protochloride of uranium. Sulphurous acid is evolved, and a greyish-green precipitate results, which is very soluble in acid. When this compound is heated, the acid is liberated, and protoxide, or, when access of air is allowed, urano-uranic oxide remains. The following formula represents the constitution of this salt, which will be found in the valuable paper to which I have alluded:—

$$2\,UO\,.\,SO_2 + 2\,HO$$

The sulphite of the peroxide of uranium falls as a beautiful light-coloured flocculent powder, when the nitrate is treated with sulphite of ammonia. It is very persistent in air, and, when heated, parts with its acid, and the remaining dark mass is probably the urano-uranic oxide. This salt is also deposited as a crustaceous mass, when sulphurous acid is conducted into water containing the hydrated peroxide in suspension.

Analysis of the Salt dried over Sulphuric Acid.

1·275 grm. salt, treated with nitric acid, &c., gave:
·682 grm. sulphate of barytes = ·187 sulphurous acid; and
1·491 grm. salt, ignited with chromate of lead, gave:
·201 grm. water.

The subjoined is the above numerical result in per cents., with the uranium taken as loss:—

	Theory.	Found.
1 eq. sulphurous acid . .	401·17	15·83 14·70
1 eq. peroxide of uranium	1800·00	70·89 71·72
3 eq. water	337·50	13·28 13·58
	2538·67	100·00 100·00

Formula: $U_2\,O_3\,.\,SO_2 + 3\,HO$

SULPHITE OF TITANIUM.

Hydrated oxide of titanium is very sparingly soluble in aqueous sulphurous acid; the sulphite deposits when the liquor is boiled.—*Berthier.*

I endeavoured to form the sulphite of *ethyle* by passing dry sulphurous and hydrochloric acid gases into absolute alcohol, and treating with water, but this method proved unsuccessful. I was not more fortunate in obtaining it when I distilled the menstruum, and added the precipitant.

The sulphurous acid in the preceding analyses will be found always under theory, from the following causes:—

I.—*All* the sulphites contain more or less sulphate, which is never taken into account in the analyses.

II.—On the addition of nitric acid to the sulphite, in order to convert the whole into sulphate, a portion of sulphurous acid escapes decomposition; the same takes place when chlorine is passed through the sulphite; the free hydrochloric acid formed expels some of the sulphurous acid.

I have found the results more accurate by precipitating the sulphurous acid (and any sulphuric that may be present) with nitrate of barytes, and then treating with the nitric acid or chlorine.

I hope that, in the foregoing remarks, I have sufficiently proved that a very strong similarity subsists between the sulphites and carbonates; the subject is an exceedingly interesting one, and will, I trust, be greatly extended, and the analogy placed on a firmer foundation, in my next paper.

In conclusion, I shall speeify in symbols the sulphites I have analysed (and also some of those mentioned by other investigators), with their analogous carbonates, and I shall also remark those carbonates that are required to complete the series:—

Sulphites.	Corresponding Carbonates.
$KO\,.\,SO_2 + 2\,HO$ . .	$KO\,.\,CO_2 + 2\,HO$
$KO\,.\,SO_2 + HO\,.\,SO_2$.	$KO\,.\,CO_2 + HO\,.\,CO_2$
$KO\,.\,SO_2 + SO_2$ . . .	Wanting.
$Na\,O\,.\,SO_2 + 10\,HO$.	$Na\,O\,.\,CO_2 + 10\,HO$
$Na\,O\,.\,SO_2 + HO\,.\,SO_2$	$Na\,O\,.\,CO_2 + HO\,.\,CO_2$
$Na\,O\,.\,SO_2 + HO\,.\,SO_2 + 8\,HO$	$Na\,O\,.\,CO_2\,.\,HO\,.\,CO_2 + 8\,HO$

I do not know of any carbonates of ammonia corresponding to the sulphites which I have described.

$Ba\,O\,.\,SO_2$	$Ba\,O\,.\,CO_2$
$Sr\,O\,.\,SO^2$	$Sr\,O\,.\,CO_2$
$Ca\,O\,.\,SO_2 + 2\,HO$ . .	Wanting.
$Mg\,O\,.\,SO_2 + 3\,HO$.	$Mg\,O\,.\,CO_2 + 3\,HO$
$Al_2\,O_3\,.\,SO_2 + 4\,HO$.	Wanting.
$Fe\,O\,.\,SO_2 + 3\,HO$ . .	Wanting.
$Mn\,O\,.\,SO_2 + 2\,HO$.	$Mn\,O\,.\,CO_2 + 2\,HO$
$Ni\,O\,.\,SO_2 + 4\,HO$.	Wanting.
$Ni\,O\,.\,SO_2 + 6\,HO$.	Wanting.
$Co\,O\,.\,SO_2 + 5\,HO$.	Wanting.
$2n\,O\,.\,SO_2 + 2\,HO$ . .	Wanting.
$Pb\,O\,.\,SO_2$	$Pb\,O\,.\,CO_2$
$Cn_2\,O\,.\,SO^2 + HO$ . .	$Cn_2\,O\,.\,CO_2 + HO$
$Ag\,O\,.\,SO_2$	$Ag\,O\,.\,CO_2$
$2\,UO\,.\,SO_2 + 2\,HO$.	Wanting.
$U_2\,O_3\,.\,SO_2 + 3\,HO$	Wanting.

The most difficult carbonates to procure, in order to strengthen the analogy, would be those of alumina and platinum.

PREPARATION OF THE TARTRATE OF PROTOXIDE OF IRON.—M. Bolle has observed that four parts sulphate of iron and three parts tartaric acid dissolved in water at the ordinary temperature to a perfectly clear solution, but, on being heated, prototartrate of iron separates as a bluish white powder, which again disappears on cooling. To collect this compound, therefore, it is requisite to boil the mixture, allow it to subside, to decant rapidly the liquid, which operation must be frequently repeated, when the precipitates are washed with boiling water. The prototartrate of iron is obtained more easily and in the form of an olive green powder, by decomposition of the protochloride of iron with neutral tartrate of potash. Both preparations are anhydrous, and afford 40·6 per cent. peroxide of iron.—*Archiv der Pharm.*

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* *Annalen der Chem. und Phar., Band. XLII.*, page 316.

† *Liebig's Chimie Organique*, Paris, 1840, p. 102.

‡ *Erdmann's Jour. für Prakt. Chemie, Band. XV.*, page 215.

* *Annalen der Physik und Chemie* (1843), No. 5, page 17.

ON THE EXTRACTION OF BEET-ROOT SUGAR.

By M. PAYEN.

My position, as professor of applied chemistry, imposes on me the necessity of investigating, and of publicly discussing, theoretical and practical questions concerning our great manufactures; every year, either at the central school or at the Conservatory of Arts and Trades, I am obliged to make known the progress due to the active intelligence of our manufacturers.

If the opinion which I gave, this very year, concerning the present and future state of home and colonial sugar manufactories, seem to possess some value, it is because it embodies the opinion of skilful manufacturers, and because it has received their acquiescence. Besides, in publishing, on this subject, a very interesting communication in the last *Comptes Rendus*, M. Dumas raised the controversy concerning the important and delicate questions which his communication will cause to spring up; the Academy will, therefore, I hope, admit that it is my duty to discuss them here.

I hasten to say that the ingenious observations of M. Schuzenbach, on the crystallisation, even when they might introduce a new idea in the clearing, and might constitute an invention, even when they might enable us to obtain as much white and pure sugar as is obtained from crude sugar by known processes, which appears to me doubtful; these observations I say, deduced, without doubt, from M. Thénard's opinion concerning the employment of saturated solutions of sugar, from the practice of clearing, and from the plan of the crystallisers of M. Crespel-Delisse, do not appear to me comparable to any of the great inventions introduced by French industry into the extraction of indigenous sugar, and into colonial manufacture —inventions to which are due, first, animal charcoal; second, black in grains; third, revivification; fourth, concentration, with double effect *in vacuô;* fifth, the moulding of granulated sugars. I think I may appeal to M. Dumas himself.

With these inventions, and their new improvements, with the processes of crystallisation and clearing, which are well known, crystallised sugar may and ought to be obtained in the pure and white state. Such was, indeed, the conclusion of a report which I made on the process of M. Perraud, and the sugar obtained in loaves by this method should not, in any case, be mixed with 10 per cent. of molasses, as is the case with the sugar of M. Schuzenbach.

Thus, therefore, M. Schuzenbach does not appear to me to be able to claim the greatest share in the improvement of the extraction of sugar. Time will teach us if we may, with good reason, reclaim the honour of an useful and real invention; time which, especially in applications, often does justice to too sanguine hopes.

Three very remarkable examples here very naturally find a place. Ten whole years were occupied in very large experiments, in successive improvements, relative to the process of maceration, &c., bringing to the end of each country a firmer conviction in the mind of its celebrated inventor, concerning the advantages of a method capable of furnishing 95-100ths of the juice of the beet-root; however, the reporters of the *Concours* of the central Societies of Agriculture and Encouragement, were still in doubt. Now, doubt is no longer permitted, for the process, since last year, has disappeared from all the manufactories which had adopted it.

One of the most ingenious and best recommended apparatus, which, acting in a continuous manner, gave without heat or pressure, by a simple, spontaneous, methodical washing 90 per cent. of juice from the pulp, is abolished after having increased the expenses and diminished the products of the establishments which employed it.

Less time, but heavier sacrifices, developed the impracticability in France of the method of M. Schuzenbach, and which promised still more than his present system of crystallisation.

I might cite twenty other hardy conceptions, which, at least, their authors have applied at their own risk; but I have said sufficient to justify the reservation I have made, the recommendations which I have given, to wait prudently, if it were only to ascertain whether we do not already possess the equivalent of the invention presented.

In concluding, I beg the Academy to allow me to present here the conditions of success which I consider most important in the economical extraction of indigenous sugar:—

1. Adaptation of soil, cultivation and employment of pulps, diminishing by 12 or 13 francs the intrinsic value of 1,000 kilogrammes of juice.

2. Relaxation by one-half of the speed of the mechanical pushers, and an increase in the number of rasps, in order better to divide the tissue of the beet-roots in the same time.

3. More gradual and more powerful pressure by increasing the number of hydraulic presses.

4. Employment of more considerable quantities of black in grains, by aid of filters of three times the size.

5. The realised perfection of the apparatus by Degrand, Derosne and Cail, which enables us further to diminish the temperature of the evaporation by means of a more powerful vacuum.

6. Revivification of the black in grains by recently improved processes.

7. Preparation of crystals better suited for clearing, by employing the best processes in use, or the modification added by M. Schuzenbach.

8. Methodical clearing in the cases of M. Schuzenbach, or, better still, in hoppers with false bottoms. The forms furnished with sand, or a sieve, or the filters of Dumont.

9. Moulding of perfectly purified crystals.

It will be readily understood that, by operating thus, only pure sugar, immediately applicable to consumption, would be sent away from the rural manufactories; that leaving, besides, for the nourishment of animals and the manuring of lands, the leaves, pulps, molasses, scums and deposits, the mass of the dung-hills, and the power of the soil, would be increased.

Such results are well worthy the attention of the legislature; they lead us to form, with M. Dumas, sincere wishes that the shackles which retard the purification of sugars, may totally disappear from our laws.

M. Dumas, without noticing the object of the remarks communicated to the Academy by M. Payen, confined himself to observing that the manufacturers of Valenciennes had anticipated him in all his wishes, for:—

1. Every one knows their skill as agriculturits and farmers.

2. They have long diminished by one-half the speed of rasping, by doubling the number of their rasps, which furnishes them much better divided pulps.

3. They press much better and with the addition of water, according to my advice, and they have obtained good results from this addition.

4. Their charcoal filters are now three metres in height, which appears difficult to be exceeded.

5. They employ the apparatus of Degrand, Derosne, and Cail, with all their improvements.

6. They revive their charcoal in newly-introduced furnaces, and which are supposed to be the best.

In a word, they have long practised that which M. Payen recommends to them as regards the operations which bring the juice of beet-roots to 30° of the areometer. I need say nothing of all these processes, which are well known, since it is at 30° that M. Schuzenbach takes the juice of beet-root, in order to submit it to his new system of crystallisation and clearing. This system is based on a scientific view, which appeared to me new. M. Payen's observations have not changed my convictions. I leave to M. Schuzenbach the task of proving that he has not bestowed on sugar manufacture a view so sterile as M. Payen supposes or fears.

Moreover, as M. Payen adopts, in his paragraphs 7, 8, and 9, M. Schuzenbach's method of working, rejecting his apparatus, the question thus limited would touch on private interests, to which I have all my life wished to remain a stranger.

At all events, and to conclude, the manufacturers of Valenciennes, whose manufactories I have visited, have done for six months that which M. Payen now recommends them. I add that M. Schuzenbach has introduced into the manufacture of sugar a scientific principle, which I regard as new, and which cannot be confounded with all the incomplete ideas which are compared with it.

M. Payen replied that his sole object was precisely to present a state, which M. Dumas himself acknowledges to be accurate and complete, of the great improvements invented by our manufacturers and constructors of apparatus—improvements much more important than the modification proposed by M. Schuzenbach, and which are not yet all introduced into the greater number of sugar manufactories.—*Chemist.*

ON THE MANUFACTURE OF SUGAR.

By M. DUMAS.

For a long time much has been said of a new and very remarkable improvement made in the manufacture of indigenous sugar, by M. Schuzenbach, and practised in some manufactories of the department of the North. I was desirous of making myself acquainted with the results which he had furnished. I therefore went lately to Valenciennes, where I could see the processes of M. Schuzenbach carried on on a large scale, at the establishment of MM. Harpignies, Blanquet and Co., who are always among the first to entertain improvements in our indigenous manufacture. Thanks to the details afforded me by these gentlemen, and to the confidence of M. Schuzenbach, who has been kind enough to place in my hands a completed and detailed description of his processes with the indications of the principles which have guided him, I have been enabled to form an opinion concerning the delicate questions which will necessarily be raised; and I have considered it my duty to submit them to the Academy, which contains judges at once best informed concerning these matters, and in the best position for causing truth to prevail.

The following are the facts:—

M. Schuzenbach, by very accurate observations concerning the causes of the alteration which the solutions of sugar in water undergo, has been enabled to discover very simple processes which allow of the recovery, under the form of crystals, at least to nearly 1,100th of all the crystallisable sugar which the solution contains.

Moreover, when this sugar is reproduced in crystals, it is sufficient, to render it colourless, to submit it to a systematic washing with solutions of sugar made without heat by means of apparatus invented by M. Schuzenbach; these washings are made with great facility, and, far from diminishing the proportion of sugar submitted to washing, increases it considerably in weight.

Finally, by a solution and crystallisation then very easy, M. Schuzenbach converts into royal sugar the whole of this sugar thus purified.

It is thus that this skilful manufacturer is enabled to obtain from the variety of sugar which is called good-fourth (*bonne-quatrième*), at least 80 per cent., and sometimes 90 per cent., of royal sugar. The members of the commission, which was charged, some years ago, by the Minister of Commerce, with fixing the produce of sugars in refining, and our illustrious colleague M. Thénard in particular, were, therefore, quite right when they maintained, against the assertion of our refiners, that, by working properly, at least 75 kilogrammes of refined sugar should be obtained from 100 kilogrammes of crude sugar.

These processes of refining have been put in practice in a very great number of refineries.

Again, M. Schuzenbach has ascertained that beet-root juice, when once brought to 30° of Beaumé, may furnish on the large scale, by his processes, exactly all the crystallisable sugar which can be extracted by the most careful chemical analysis.

These processes have been put in practice on a large scale in the manufactory of Tirlemont, in Belgium, and with some modifications which deficiency of apparatus rendered necessary in the manufactories of MM. Harpignies, Blanquet and Co., Harpignies, Delaunay, and Co., Leroi, Hamoir, &c.

Everywhere the success has been so much the more complete as the process devised by M. Schuzenbach has been more strictly adhered to, and as the state of the material has not been too much altered.

At Tirlemont, for example, where ten millions of pounds of beet-root have been operated on, about 5·5 of royal sugar have been extracted from 100 pounds of beet-root. It is estimated that, from unfavourable circumstances this year, a greater quantity could not have been extracted from crude sugar. Besides, the expenses of manufacture have remained the same as ever.

At M. Blanquet's manufactory this year, thirty thousand sugar-loaves, similar to those which I deposit with the Academy, have been produced. They have been brought to the state which is designated under the name of stamped sugar *(tapè)*, the weather not having permitted the necessary material to be organized, in forms of varnished iron plate.

The principles on which M. Schuzenbach founds his new method of extraction have, therefore, the result of rendering fully practicable that which we might have feared seeing remain long still in the domain of pure theory; for only two products now leave the manufactories which work according to these principles; viz., perfectly white loaf sugar, and molasses so exhausted as not to be able to serve for distillation. All the intermediate qualities have disappeared, and the produce, far from suffering, has sensibly increased.

These results have been obtained perfectly independent of the old process of drying beet-root, which M. Schuzenbach first practised on the large scale; but, according to the observations which his long experience has permitted him to make, this skilful manufacturer has ascertained that desiccation was successfully practicable only with beet-root grown on sandy, sterile, or not very productive soils, which furnish much smaller crops than the very rich lands of the department of the north, for example, but which give a root whose juice may be said to be only a solution of sugar very easy to be worked. These dried beet-roots are preserved without alteration.

It is not so with the beet-root gathered in the parts of France which are more particularly devoted to this manufacture.

Moreover, M. Schuzenbach has placed at my disposal all the information relative to the method of working by desiccation which has been practised without interruption in a great number of manufactories in the north of Europe for some years, and which, for example, this very year, has been applied, in a single manufactory in Hungary, to thirty million pounds of dry beet-roots, the same manufactory having also treated thirty millions of pounds of fresh beet-roots by the ordinary methods.

It is evident that the processes of M. Schuzenbach give us the means of extracting, without any loss, all the sugar which is found in beet-root juice brought to 30° Baumé. If, then, we extract only from 5 to 6 per cent. of the weight of beet-root which really contains 8 or 10 per cent., it must be concluded that the preceding operations have destroyed or altered the portion of sugar which is not obtained.

The attention of chemists should, therefore, be entirely turned to the alterations which the beet-root undergoes at the time of rasping and by desiccation, and also to the means of preserving to the animal charcoal all its qualities, or to suppressing the employment of those which, on account of the impurities with which it is contaminated, might have serious inconveniences.

By means of some possible and easy improvements in this part of the work, the manufacture of beet-root sugar will be placed among the most perfect of chemical manufactures; for all that portion of the work which M. Schuzenbach has just handled, presents the model of a certain application of the principles of science to the practice of manufactories.

Now, we are forced to conclude from these new facts, that the legislation of sugar is very deficient; for, according to the basis of the estimation of qualities for the deduction of the duties on sugars, we are led to the distressing result of which I have lately been witness in one of the principal manufactories in the department of the north, where fine white sugar is made by M. Schuzenbach's process, and where it is afterwards piled up in order to mix with it 10 per cent. of molasses, in order to reduce it to the quality of good fourth. If this operation were not performed, there would be a loss, on account of the exaggerated over-tax which would be required to be paid to the treasury. —*Chemist.*

ON THE PREPARATION OF PERCHLORIDE OF IRON.

The sesquichloride or perchloride of iron exists in the anhydrous state and in the state of hydrate.

There are two processes for obtaining the anhydrous salt. The first consists in putting iron filings into a luted glass or porcelain tube, placed in a furnace, the tube being sufficiently long to project some distance beyond the furnace, and the iron being kept in that part of the tube directly exposed to the heat. When the apparatus has been thus arranged, the tube is heated to a temperature below that of red heat, about 752° Fahr., and then a current of dry chlorine is made to enter at one end of the tube. The chlorine is rapidly absorbed, the iron becoming incandescent, while copious vapours of sesquichloride are formed, which condense in the form of scales, having a violet colour and metallic lustre in the cool part of the tube.

The second process consists in saturating commercial hydrochloric acid with hydrated peroxide of iron, either in the dry or moist state. The solution is commenced without heat, it is afterwards continued with the aid of a gentle heat; when the acid ceases to dissolve any more oxide, the liquor is filtered and evaporated to dryness in a porcelain capsule, taking care to moderate the heat and to stir constantly. The product of this operation is introduced into an earthen retort, and heated gradually, taking care not to apply any fire to the dome of the retort. Aqueous vapours are first disengaged; when these cease to appear, a cork is loosely fitted to the mouth of the retort, and the heat is then increased until the bottom of the retort becomes nearly red hot towards the close of the operation. The anhydrous perchloride sublimes on to the dome and into the neck of the retort, which is to be broken when cold, and the salt immediately enclosed in bottles.

Although the second of these two processes is the better and more easy of execution, yet many pharmaceutists would find a difficulty in preparing it; moreover, the Codex orders as the medicinal perchloride of iron that which is prepared by the moist way.

Several processes have been proposed for making the hydrated perchloride of iron, which I will describe.

The Codex orders the red oxide of iron to be dissolved in hydrochloric acid, and the solution evaporated to dryness in a water-bath. This process is a bad one, because, however carefully it may be evaporated, the product always contains a large proportion of insoluble oxychloride.

MM. Thénard, Berzelius, and Orfila, recommend in their works to prepare it by dissolving sesquioxide of iron in hydrochloric acid, evaporating the solution to the consistence of syrup, and allowing it to cool. The perchloride is deposited in fine red crystals, which are very deliquescent.

M. Béral has proposed to prepare it by dissolving precipitated sesquioxide of iron in hydrochloric acid, first, without heat, and then with the heat of a water-bath, the solution is transferred to a porcelain capsule, and evaporated at a gentle heat to the consistence of syrup. When it has arrived at this point, the capsule containing the perchloride of iron is placed by the side of another capsule, containing caustic potash or lime, and the whole covered by a bell-glass. The alkali absorbs the water and hydrochloric acid, so that in ten or fifteen days the chloride becomes a dry imperfectly crystallized mass. To keep the salt dry it should be at once put into a bottle, before it becomes affected by the external air. This method answers very well, but it has the disadvantages of requiring a good deal of time, and affording a chloride which is not always uniform in composition, as it contains variable proportions of water, owing to the method adopted in its preparation.

M. Mohr has recently proposed to prepare the perchloride of iron by dissolving hæmatite by digestion in commercial hydrochloric acid, and boiling the mixture towards the end of the operation. The liquor is allowed to become clear, is then evaporated to the consistence of a syrup, and afterwards exposed in a covered vessel, in a cold place, such as a cellar, where after a few days it begins to crystallize, and continues to do so for several weeks. The mother-water is decanted, and the crystals preserved.

M. Mohr analysed the chloride prepared in this way, and found it to contain twelve atoms of water. He has, therefore, assigned to it the formula $Fe_2 Cl_3 \bowtie 12\ H\ O$.

M. Fristche, who undertook a fresh investigation to determine the proportion of water contained in Mohr's chloride, found that the analysis of this chloride (and the same is also true of those prepared according to the processes of Orfila Thénard, and Berzelius) affords very variable results with reference to the proportion of water, so that it is impossible to say whether it contains 10, 11, or 12 atoms of water. With 10 atoms it should contain 35·92 per cent., with 11 38·15, and with 12 40·22.

According to the same chemist, if the preceding chloride be left under a bell-glass with sulphuric acid, the crystals are again reduced to the state of a thick liquid, from which fresh crystals are formed, containing from 21 to 23 per cent. of water. If they contained 5 atoms of water, there would be 21·9 per cent. These same crystals may be also obtained, according to M. Fristche, by fusing the chloride with 10, 11, or 12 atoms of water, evaporating so that a drop will solidify on cooling, and adding a few drops of concentrated hydrochloric acid before putting it to cool.

M. Fristche has been led by his researches to admit the existence of two hydrates of perchloride of iron perfectly crystallizable, between which there is no crystallizable combination.

As will be seen, many processes have been given for the preparation of hydrated perchloride of iron, but none of these are adapted for obtaining it readily, of uniform composition, entirely soluble, and susceptible of long preservation. The principal cause of the easy alteration which the chloride of iron undergoes when prepared by either of the processes described above, seems to be the large quantity of water which it retains. Thus, that of M. Béral, which contains the least, affords, soon after its preparation, a perceptible deposit of oxychloride, when dissolved in water.

Induced by M. Soubeiran to seek a practical process for obtaining, in a short time, a perfectly soluble perchloride of iron, of a sufficiently uniform composition to admit of its strength being easily estimated, I believe I have succeeded, by submitting a solution of sesquioxide of iron in hydrochloric acid to evaporation under the two following conditions: first, evaporation at a temperature not exceeding 212° Fahr.; secondly, evaporation in perfectly dry air.

After several experiments, the following is the process at which I have stopped:—Take of hæmatite, that which mineralogists denominate concrete red oxide of iron *(fer oxydé rouge concrétionné)*, reduced to powder by pounding and triturating in small quantities at a time in an iron mortar, introduce this into a stoppered bottle, and add to it pure concentrated hydrochloric acid in such quantity that there shall be an excess of hæmatite, then agitate the mixture. The two bodies soon react upon each other, producing water and perchloride of iron, accompanied with the disengagement of heat. This first action having subsided, place the bottle near the fire, and shake it from time to time. After remaining in contact for several hours, allow it to deposit, and then filter the solution. The filtered liquor is received in a porcelain capsule, which is

placed either on sand heated by steam, or over the mouth of a cucurbit, taking care to interpose a piece of flannel between the capsule and the cucurbit, which should be tied on to keep it in its place. The apparatus should be so arranged that the vapour may be all condensed by means of a proper refrigerator, as it is essential to the success of the process that no steam should circulate around the capsule, for if the liquor be evaporated in air charged with moisture, it undergoes decomposition at a certain point of concentration, hydrochloric acid being disengaged, and sesquioxide of iron precipitated. It should be stirred with a glass spatula during the whole time of evaporation, which must be continued until the liquid no longer disengages any sensible vapours of hydrochloric acid, and a drop solidifies on cooling. When it has arrived at this point the chloride is poured into perfectly dry bottles, furnished with good corks, but as the salt on cooling becomes very hard, it is difficult to get it out of the bottles, to obviate which inconvenience, M. Soubeiran, who repeated the process, very judiciously recommended to pour it into a plate which has been slightly greased, and immediately to cover it with another plate, and lute the two together. After about twenty-four hours the plates are to be separated, the chloride broken, and immediately introduced into well-stoppered bottles.

The perchloride of iron thus prepared possesses a dark yellowish-red colour, no smell, and a very styptic taste. It is very soluble in water; the solution, which is of a fine golden-yellow colour, keeps for an indefinite time exposed to the air without becoming turbid. It is also very soluble in alcohol and in ether.

Exposed to the air, it rapidly absorbs moisture, which it at first solidifies, but it soon afterwards deliquesces, so that it is necessary to keep it in dry well-stopped bottles.

This chloride possesses the great advantage of keeping a long time without undergoing decomposition, owing, no doubt, to the small quantity of water which it contains. Thus, the specimen which I possess, is now, eight months after its preparation, in the same state as when first prepared.

To determine the quantity of water which it contains, I took four specimens of the chloride, one of which had been prepared by M. Soubeiran, and the other three by myself. One gramme of each was decomposed by a gentle heat, and the decomposition assisted by the addition, from time to time, of a few drops of nitric acid. The four specimens afforded products of sesquioxide of iron very nearly the same. That prepared by M. Soubeiran afforded 0·393, and the three others, 0·392, 0·385, and 0·380. The mean of these four quantities is 3·875, which represents 26·86 per cent. of iron. But 26·86 of iron requires 52·58 of chlorine to form sesquichloride, so that it follows that 100 parts of the chloride consist of

Iron	26·86
Chlorine	52·58
Water	20·56
	100·00

This chloride contains about one-fifth of its weight of water, or rather less than five atoms, for five atoms would be in the proportion of 21·9 per cent. It corresponds with the hydrate, containing five atoms of water, of M. Fritsche.

The process that I propose, has then, the great advantage of affording a chloride entirely soluble, which has a composition sensibly uniform, and which may be kept for a long time, objects which have not hitherto been attained.—*Journ. de Pharm.*, and *Pharmaceutical Journal.*

On the Cholic Acid, Choloïdic Acid, and Product obtained from Ox-Bile by means of Oxidizing Agents; with some Remarks on the Formula for Proteine.

By Geo. Kemp, M.D., Cantab.

Next in importance to the determination of the chemical composition of a body by actual analysis, must be ranked those analogous bodies obtained by the operation of agents which effect changes easily observable and readily traced. Whilst the former, by comparison of the ratio of the elements respectively with the combining weight, also ascertained, furnishes us with an accurate expression or formula for the body as a whole, the latter, taken collectively, must as certainly represent the original mass, as the sum of the parts is equal to the whole.

Some of the most interesting of the changes alluded to, and invaluable as the means of solving various abstruse problems, particularly in animal chemistry, are effected by means of the action of caustic alkalies and acids containing a large relative proportion of oxygen; under both of which circumstances, however, we may, to a certain extent, consider a powerful oxidation as the cause of the results observed.

During the action of caustic potash, for instance, on a body containing the four organic elements, we obtain on the one hand carbonic acid, on the other ammonia, as the result of the decomposition of the hydrate water of the alkali. A good illustration of this is afforded in the production of cholic acid by digesting ox-bile in a strong solution of caustic potash. This interesting body seems to have been first discovered by Gmelin, and subsequently prepared by Demarcay, in a manner described at length by Berzelius (ix. p. 279). Some discrepancy is observable in the description of the body as prepared by the two philsophers. Gmelin,* by destructive distillation, obtained an ammoniacal fluid, a certain indication of the presence of nitrogen. Dumas, on submitting Demarçay's preparation to ultimate analysis, found that element entirely wanting. Comparatively recent researches afford a clue to explain, in a very probable manner, the cause of this circumstance. In the examination† of the elementary composition of the mucus of the gall-bladder, that secretion was found to contain 15 per cent. of nitrogen, and to be in fact a proteine-compound; now, by the action of caustic potash on proteine, it was found by Mülder to be resolved, besides other bodies, into leucine, protide, and erythropotide, each of which contains upwards of 10 per cent. of nitrogen. Provided, therefore, that the mucus is not carefully removed from the ox-bile previous to digestion in caustic potash, the presence of nitrogen in the new derivatives is inevitable.

In a former number of this journal a formula was proposed for the electro-negative body, which in combination with soda forms the principal portion of the ox-bile, as follows:—$C^{48}\ H^{42}\ N\ O^{13}$; and if this formula be correct, or even approximating to the truth, we must be able to establish a very evident relation between this formula and that expressive of cholic acid. Now the formula for this body has been differently stated; according to Dumas, $C^{42}\ H^{36}\ O^{10}$; according to Liebig‡, $C^{74}\ H^{60}\ O^{18}$. We must, however, observe that both of these formulæ are merely empirical, and not founded on a combining weight decided by experiment; they must, therefore, to use the language of Berzelius, be "in a high degree unsafe." In order to remove any doubt on the subject, I prepared a portion of this acid with the greatest possible care, combined it with the oxide of silver, and thus estimated its equivalent weight.

358 milligrammes of the silver salt burnt in a porcelain crucible, gave metallic silver = 0·122.

And 122 : 358 :: 1350§ : 3961.

Considering this body as containing 2 equivalents of base to 1 of acid, we obtain the combining weight = 5022; and if we subtract 1 equivalent of carbonate of ammonia from the proposed formula for the electro-negative body in the ox-bile, we have—

$(C^{48}\ H^{42}\ N\ O^{13}) - (CO^2 \times NH^3) = C^{47}\ H^{39}\ O^{11} = 5111$

But the results of the analysis of the cholic acid by Dumas are in 100 parts—

		Calculated as $C^{47}\ H^{39}\ O^{11}$*
Carbon	68·5	68·9
Hydrogen	9·7	9·5
Oxygen	21·8	21·5

a circumstance which strongly confirms the correctness of the formula I have proposed for the ox-bile. On no consideration, however, can Liebig's formula, $C^{74}\ H^{60}\ O^{18}$, be supported as a rational formula.

With reference to the choloïdic acid, the same sources of uncertainty and error exist as we have hitherto witnessed with reference to cholic acid; no equivalent number was, or could be determined by Demarçay on repeated trials. Now, on treating ox-bile with sulphuric acid, I have obtained, in addition to the choleic acid of Demarçay, a body resembling in its physical characters the choloïdic acid of Demarçay; and on deducting from my formula for ox-bile the formula for Demarçay's choleic acid, we obtain a formula accurately expressive of the results of his analysis of choloidic acid; thus,—

$(C^{48}\ H^{42}\ NO^{13})$‡ $- (C^{42}\ H^{37}\ NO^{12}) = C^6\ H^5\ O = 612$, giving—

		Dumas found†
Carbon	73·5	73·3
Hydrogen	10·1	9·7
Oxygen	16·4	17·0

Although this circumstance is not by any means brought forward with the confidence of a fact proved by direct experiment, still, as a step in the chain of accumulative evidence, it cannot but be considered as admissible. The formula proposed by Liebig, $C^{36}\ H^{56}\ O^{12}$, will not bear examination, as it requires a whole per cent. more carbon than was obtained by analysis.

A few observations will suffice on the product of oxidation by means of nitric acid. When a solution of ox-bile, perfectly freed from mucus, is submitted to the action of this agent, copious red fumes are given off, and the ultimate result is an acid body free from nitrogen, of which I can at present furnish only the few following particulars; for although I made Professor Liebig acquainted with this body in 1842, I thought it more important to examine the bile of omnivorous and carnivorous animals before the respective products of decomposition; and the extent and difficulty of the research will, I am convinced, be an available apology with any person practically acquainted with the subject:—

173 milligrammes gave CO^2 = 0·410
HO = 0·132
or Carbon = 64·6 per cent.
Hydrogen = 8·4 ...

which, expressed by the formula $C^{48}\ H^{39}\ O^{15}$, gives—

Carbon	61·5
Hydrogen	8·7
Oxygen	26·8
	100·0

Now $C^{48}\ H^{39}\ O^{15} = [\ (C^{48}\ H^{42}\ N\ O^{13}) - (\ NH^3\ )\ ] \times O^2$

From this very cursory examination, therefore, it is apparent that the new body accurately expresses the electro-negative portion of the ox-bile deprived of its nitrogen in the form of ammonia, and oxidised by the agency of the nitric acid.

Having thus established the composition of the body by its ultimate analysis, by obtaining an equivalent number, by an examination of the products of decomposition, and by analogical reasoning in the case of choloïdic acid, it will, I am sure, be granted by impartial, competent judges, that the course pursued has been a fairer and more philo-

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* Berzelius, ix. p. 278—280.

† Kemp, "Ueber die Zusammensetzung des Schleims."—*Annalen der Chemie*, vol. xliii. p. 117.

‡ *Animal Chemistry*, p. 349.

§ Marignac's equivalent number for silver.

* Carbon = 75.

† Demarçay's formula is $C^{42}\ H^{36}\ N\ O^{12}$. I have taken the slight liberty with the hydrogen, in order to show the analogy, though $C^{42}\ H^{37}\ N\ O^{12}$ does in fact equally well express the results of the analysis.

‡ Berzelius, ix. p. 268.

sophical one than suggesting theories first and bending facts to them afterwards.

Perhaps it might appear, to an ordinary reader of the researches which are now going on in animal chemistry, that the bile has been forced upon him *usque ad nauseam;* it must be remembered, however, that on its true composition depends the truth or falsehood of by far the greater number of the theories which Professor Liebig has advanced in his work on Physiology and Pathology. From an empirical formula of the bile, which has now been satisfactorily proved to have no foundation in truth, he has deduced a formula of proteine, totally different from the facts of the case as elicited by Mülder; and, until the public mind is disabused on the subject, it will be a hopeless task to press upon its attention deductions which are calculated not only to solve some of the most intricate problems in physiology, but also to confer real benefit on mankind by an additional insight into the nature of morbid actions. The really well-informed, and nature-seeking class of men, in all countries, a small but chosen band, will attribute due importance to researches carried forward on right principles; and to such the honest labourer will never make a vain appeal for that consideration and forbearance which his imperfect labours may demand.—*Chemical Gazette.*

ANALYSIS OF THE MINERAL WATER AT DRIBURG.*

BY F. VARRENTRAPP.

The water of the spring in the hall at Driburg, which was newly enclosed last year, is perfectly clear, very pearly, of a pungent and somewhat saline ferruginous taste, depositing, when for some time in contact with the air, a reddish yellow precipitate, consisting of carbonate of lime and oxide of iron, its temperature constantly being $8\frac{3}{4}$°R. ($51°\frac{11}{16}$F.)

DETERMINATION OF THE SPECIFIC GRAVITY.

A bottle which, at a temperature of 8·75°R. ($51°\frac{11}{16}$F.) contained 88·997 of Driburg mineral water, contained at the same temperature only 86·05 grms. of distilled water; hence the specific gravity of the mineral water = 1·004427.

Another bottle, which contained 1064·83 grms. of mineral water, held only 1059·08 grms. of distilled water, hence the specific gravity of the mineral water = 1·004570.

QUALITATIVE ANALYSIS.

Exposed to the air, and quicker when heat was applied, the water became turbid, disengaging much carbonic acid gas, and depositing a reddish-yellow precipitate. This precipitate consisted chiefly of carbonate of lime and oxide of iron, with an admixture of a slight quantity of clay, manganese, phosphoric acid, and silica, crenic and apocrenic acids.

The quantity, however, of these latter substances found therein was so inconsiderable that it could not be acertained with precision, though their presence was evident in the residue obtained by boiling 100 pounds till 1½ pounds were left, and the insoluble substances were removed. On evaporating the water to that extent, the residue was found to contain much sulphate of lime; it being intended that the deposit formed by boiling be freed from it, the evaporated water was to be compensated by distilled water. In the water that had been boiled, after filtration, was found a considerable quantity of lime and sulphuric acid, soda, some potassa, chlorine, and magnesia. Bromine, iodine, fluorine, and lithium, could not be detected in the water.

QUANTITATIVE ANALYSIS.

I. DETERMINATION OF THE CHLORINE.

a. 71·00 grms. water yielded 0·029 grms. chloride of silver, which shows 1·007 of chlorine in 10000 parts of water.

b. 142·005 grms. water yielded 0·059 chloride of silver, which shows 1·025 of chlorine in 10,000 parts of water.

II. DETERMINATION OF THE SULPHURIC ACID.

a. 415·16 grms. of water yielded 1·501 sulphate of baryta, which shows 12·43 parts of sulphuric acid in 10,000 of water.

b. 418·06 grms. water yielded 1·520 sulphate of baryta, which shows 12·49 sulphuric acid in 10,000 of water.

III. DETERMINATION OF POTASSA AND SODA.

a. 999.05 grms. of water yielded 0·501 grms.

b. 470·76 water yielded 0·236 grms. of a mixture of chloride of potassium and chloride of sodium.

The residue obtained from *a*, on being dissolved in some water, and treated with chloride of platinum, yielded 0·110 of potassio-chloride of platinum, showing 0·039 chloride of potassium, hence 0·33 parts of chloride of potassium in 10,000 of water; consequently, 10,000 parts of water contain 4·685 chloride of sodium, and 0·33 parts of chloride of potassium, which shows 2·496 parts of soda, and 0·208 of potassa, or 0·173 of potassium.

IV. DETERMINATION OF THE IRON AND CLAY.

a. 233·92 grms. water yielded 0·0008 grms. oxide of iron mixed with some clay.

b. 1169·60 grms. water yielded 0·040 grms., which, on being treated with caustic potassa, gave 0·004 grms. of clay. This shows, on determining the quantity of the oxide of iron, by calculating that of the carbonate of the protoxide, that 10,000 parts of water contain 0·45 parts of the carbonate of protoxide of iron, and 0·03 parts of clay.

V. DETERMINATION OF THE WHOLE QUANTITY OF LIME.

a. 1169·60 grms. water yielded 2·494 carbonate of lime, showing, therefore, 21·323 parts in 10,000 of water; hence 12·003 of caustic lime.

b. 492·34 grms. water yield 1·040 grms. carbonate of lime, thus showing 21·123 parts in 10,000 parts of water, and, consequently, 11·910 of caustic lime.

VI.

a. The water on being boiled for some time, and the evaporated portions compensated by new additions of water, yielded a precipitate amounting in 223·92 grms. water to 0·210 grms., consequently, to 9·36 parts in 10,000 of water.

b. 492·37 grms. water on boiling yielded 0·470 grms. of an insoluble residue, showing 9·54 parts in 10,000 of water.

VII. DETERMINATION OF THE SULPHATE OF LIME.

a. 492·37 grms. water, on being boiled and filtered, yielded 0·591 of the carbonate of lime, thus showing 0·158 grms. of caustic lime; hence, 6·78 in 10,000 of water.

b. 233·94 grms. of water, on being boiled and filtered, yielded 0·28 of the carbonate of lime, thus showing 0·1058 grms. of caustic lime; consequently, in 10,000 parts of water, 6·75.

VIII. DETERMINATION OF THE MAGNESIA.

492·34 grms. water yielded 0·05 of phosphate of magnesia, thus showing 0·018 of magnesia; consequently, 0·373 parts in 10,000 parts of water; hence, 1·096 of sulphate of magnesia.

IX. DETERMINATION OF THE WHOLE AMOUNT OF THE SOLID SUBSTANCES.

a. 470·67 grms. water evaporated at a temperature of 200° R. (482° F.) to dryness, left a solid residue amounting to 1·549 grms., thus showing in 10,000 parts of water 32·91 parts of solid substances.

b. 1169·1 grms. water evaporated to dryness at a temperature of 200° R. (482° F.) left a solid residue amounting to 3·8495, thus showing 32·928 parts in 10,000 parts of water.

X. DETERMINATION OF THE CARBONIC ACID.

239·8 grms. of water, on being treated with ammonia and chloride of calcium, in three different experiments, threw down a precipitate, from which, by the apparatus recommended by Fresenius and Will, an amount of carbonic acid was obtained in—

a. 0·843 grms.
b. 0·849 „
c. 0·850 „

Hence the whole of the carbonic acid in 10,000 of water is 35·146, and the carbonic acid in its free state, having in view Nos. 4, 5, and 7, where carbonic acid is considered in its combined state, amounts to 30·946 parts, thus showing 16·194 *cc.* (cubic centimetre) in 10,000 grms. of water at $8\frac{3}{4}$° R. ($51\frac{11}{16}$° F.) and 77 m m (30°) atmospheric pressure.

From the foregoing it results that the following is the composition of the spring of Driburg:—

10,000 parts of water contain—		GRS.	1 lb. = 16 oz. = 7680 grs—	GRS.
0·330 Chloride of potassium	Potassium	0·174	Chloride of potassium	0·253
	Chlorine	0·156	Chloride of sodium	1·120
1·459 Chloride of sodium	Sodium	0·570	Sulphate of soda	3·030
	Chlorine	0·869		
3·945 Sulphate of soda	Soda	1·729	Sulphate of magnesia	0·842
	Sulphuric acid	2·216		
1·096 Sulphate of magnesia	Magnesia	0·373	Sulphate of lime	12·547
	Sulphuric acid	0·723		
16·337 Sulphate of lime	Lime	6·786	Carbonate of iron	0·345
	Sulphuric acid	9·551		
0·450 Carbonate of protoxide of iron	Protoxide of iron	0·280	Carbonate of iron	0·345
	Carbonic acid	0·170		
0·030 Clay		0·030	Clay	0·023
0·005 Silica		0·005	Silica	0·004
9·230 Carbonate of lime	Lime	5·200	Carbonate of lime	7·088
	Carbonic acid	4·030		
30·946 Carbonic acid in its free state, 30·946 grms. = 16·194 cubic centimetres at an atmospheric pressure of 76 m m (29·9212 inches) and a temperature of $8\frac{3}{4}$° (51 11-16° F.)			Carbonic acid in its free state 23·766 = 51·6 cub. inches atmos. press. 76 m m (29·9212 inches), temperature $8\frac{3}{4}$° R. (51 11-16° F.)	

MINERAL WATER OF THE HERSTER SPRING, NEAR DRIBURG.

The Herster Spring is situated at one hour's distance from Driburg, containing, according to the following results, nearly the same substances as the mineral water of Driburg, yet essentially differing by the greater amount o sulphates of magnesia and soda, and a less quantity as well of oxide of iron as of the carbonic acid in its free state.

* *Annalen der Chemie und Pharmacie*, and *Chemist.*

The following are the calculated results :—

			GRAINS.
Water contains in 10,000 parts			7680
0·533 Chloride of potassium	Potassium	0·280	0·409
	Chlorine	0·253	
0·091 Chloride of sodium	Sodium	0·036	0·069
	Chlorine	0·055	
5·439 Sulphate of soda	Soda	2·343	4·177
	Sulphuric acid	3·006	
3·650 Sulphate of magnesia	Magnesia	1·245	2·803
	Sulphuric acid	2·415	
12·587 Sulphate of lime	Lime	5·225	9·662
	Sulphuric acid	7·356	
0·156 Carbonate of protoxide of iron	Suboxide of iron	0·096	0·120
	Carbonic acid	0·060	
11·970 Carbonate of lime	Lime	6·743	9·192
	Carbonic acid	5·227	
30·150 Carbonic acid in its free state, equal to 50·35 cubic inches			23·162
30·150 grms. carbonic acid = 16600 cubic centimetres, at + 10° R., (54½° F.) and 76 m m (29·9212 inches).			
35·446 of the whole amount of carbonic acid			27·222
34·510 of the whole of solid substances, found			26·503
34·420 of the whole of solid substances, as resulting from additions of the single determinations			26·434
12·077 Precipitate thrown down on boiling			9·275

Furthermore, in 50 lbs., evaporated to a residue of 1 lb., have been discovered traces of clay, silica, crenic and apocrenic acids, but less than in the water of Driburg.

SKETCH OF DRIBURG.

Driburg (formerly Iburg) is a small town in Westphalia, government Minden, Paderborn, on the east side of the Teutoburg forest, where the Roman general Varus was sadly defeated by Hermann, the leader of the German forces. It contains about 1,600 inhabitants.

In its vicinity, a tower, with some decayed walls, are noticed, where, in ancient times, stood the castle of Iburg, erected, according to some, by Pipinus.

Owing celebrity to its mineral waters, this town is situated in a valley, representing a bell-shaped cavity. From the north, east, and south, we mount by a gently-ascending hill, on reaching the summit of which, on a sudden, the whole is displayed to our view, being then placed upon a height of an annular shape, which surrounds the dale, descending inwards by a steep declivity.

The fountain is 633 feet above the level of the sea, and first acquired renown at the latter end of the 17th century, when several plantations were made at the command of the Bishop of Fürstemberg, and a description was given of the fountain in 1668 by Bernard Rottendorf, his archiater.

Nessel gave the first chemical analysis of it in 1714. The fountain was first cleansed in 1755.

When the bailiff Meyer was tenant of the fountain in the year 1769, the demand for the water became brisk, and much of it was sent away; but since Baron Sierstorf bought it, in the yoar 1782, it has been more frequented by visitors. The main spring is enclosed by a little building, of an octangular form, yielding 3,150 quarts—about 800 gallons—in an hour. Besides that, there are the Louisenborn, Herster, and Satzer fountains.

Until lately, the following two analyses have been considered of some credit.

Sixteen ounces of the mineral water contain

	According to Westrumb. GRAINS.	According to Du Menil. GRAINS.
Sulphate of soda	11·17	6·535
Muriate of soda	0·13	0·283
Sulphate of lime	10·68	10·973
Muriate of lime	0·06	—
Carbonate of lime	6·80	7·727
Sulphate of magnesia	2·85	7·217
Muriate of magnesia	0·90	0·574
Clay	0·05	—
Resinous extract	0·13	0·020
Carbonate of oxide of iron	1·33	0·688
Carbonate of magnesia	—	0·099
Silica	—	0·062
	34·10	34·143

CUBIC INCHES.

Carbonic acid 28·00—Westrumb.
34·99—Du Menil.

—nt—

A NEW CONSTANT BATTERY.

FROM L'INSTITUT.

At the sitting of the Imperial Academy, on the 29th of September last, from a paper which had been communicated to him by the Prince Pierre Bagration, M. M. H. Jacobi read the following note :—

The application of the voltaic battery having lately received a great development, I think it my duty to the Academy to announce an improvement which reduces this valuable apparatus to a state of great simplicity, and by which means it can be rendered very useful for practical purposes. Everybody is aware that nothing is more easy than to obtain a galvanic current. Take a piece of zinc and one of copper, united with a wire, place them in some acid or saline water, and you will produce that remarkable current which is rendered evident by its chemical as well as by its calorific and magnetic effects. But we know also the many difficulties which have to be surmounted, if we wish to obtain by this means effects, the action of which is sustained and constant. The obstacles arising from the decrease of the force, which begins to be manifested from the moment the current is formed, have, for nearly half a century, checked the progress of the science, and hindered those practical applications, the possibility of which was plainly foreseen. It is to Mr. Daniell that we owe the discovery of a constant battery,—an admirable discovery, and one which has given to galvanism an entirely new impulse. I shall not speak now of the numerous changes and improvements which have since been applied to these batteries; I shall only observe, that with the great advantages that belong to all these apparatus, there are also several inconveniencies, of which the following are the most serious :—

The employment of two liquids separated one from the other by a porous partition, renders the manipulation of this apparatus the more inconvenient, as the number of the elements is more considerable. During the action of the battery, and still more when the action must be interrupted for some time, the effects of endosmose present themselves, and occasion the mixture of the two liquids through the diaphragm. The liquids must be constantly kept at a certain degree of concentration or dilution, which is especially difficult to obtain when nitric acid is used. The pores of the diaphragm also are in the end often filled with crystals, which hinder the circulation of the current and necessitate a change, or repeated washing of these porous bags.

All those who make a constant use of batteries would undoubtedly prefer employing elements less energetic, but larger and more numerous, if by that means it were possible to obtain a constant battery, one the manipulation of which was more simple; or, more properly speaking, a battery which, when once constructed, should require no further manipulation.

The following are the means by which this end can be perfectly obtained :—

Take a flower-pot, or any other vessel impervious to water, which you fill with earth, saturated with a very concentrated solution of hydrochlorate of ammonium or sal ammoniac; you then place in it, at a certain distance from each other, a plate of copper and one of zinc, and you have a voltaic pair, which in a short time becomes perfectly constant in its action, and which can be kept in this state for months, and to all appearance even for years, provided that care is taken to moisten the soil occasionally and to renew the zinc plate when necessary, which, as we well know, begins to dissolve as soon as the circuit is closed, which, however, takes place very feebly, or in proportion to the force of the current that is produced.

Before placing the copper plate in the earth, it is well to plunge it, for some minutes, in a solution of sal-ammoniac, and then allow it to dry, until a green film is formed on its surface. This operation greatly facilitates the effect of the battery; and it even seems to me that, in this respect, brass would perhaps be preferable to copper.

The theory of this battery cannot yet be established in an exact and precise manner; but it seems that the constancy of its action is due to this,—that the hydrogen, which would be developed at the surface of the copper, is employed to reduce the double salt of that metal, which is formed by the chemical action of the sal-ammoniac on the copper; so that the constancy of its action may be considered as the expression of a kind of equilibrium between this chemical action and galvanic reaction. The earth, it appears, only acts as a very porous diaphragm, which prevents the salt of zinc from being reduced on the surface of the copper by the action of the galvanic current; and, at the same time, it prevents the possibility of the zinc having any chemical reaction on the salt of copper. We may add that it is not altogether impossible that the earth, like every porous body, absorbs the bubbles of hydrogen, which in ordinary batteries cover the copper plate, and, as we know, cause a diminution in electro-motive force.

It is advisable not to place the two plates too near each other, but to give some thickness to the bed of earth intervening between them. In like manner the plates ought not to be too small, because the earth opposes a great resistance to the passage of the current. I have not yet found time to get an exact numerical value of the constants of these batteries, nor to enter more deeply into the details of this combination, which, it is to be hoped, will yet receive many improvements, both by the zeal of the inventor, and in consequence of its more general use.

As great efforts are being everywhere made to advance the applications of galvanism, the publication of this invention ought to be no longer delayed. This battery, as we have already mentioned, is susceptible of many applications, and its utility is principally discovered in those cases in which very energetic effects are less an object than a constant and prolonged action—as, for example, in the reduction of metals, in chemical decompositions, &c. I do not see what inconvenience there could be in placing in a cellar or granary some hundreds of these vessels or flower-pots, which might furnish a perpetual source of electricity, to be used at pleasure. I have myself placed in my house a battery of this kind, consisting of twenty-four elements, which has been in action for about six weeks, without there having been the least occasion, during all this time, to make the slighest alteration. It is needless to add that the vessels ought to be very well insulated, especially when we employ a series of many elements. As there is a great resistance in the pile itself, the loss occurring from defective insulation would become more sensible than in Daniell's batteries and others.

The invention of this battery is due to the Prince Pierre Bagration, lieutenant to the horse-pioneers of the guard, and aide-de-camp to General Vitoftoff, chief of the engineers of the guard.

I think it necessary to add one more remark. Some time ago, I placed in the earth, to the level of the water, two very large plates of zinc and copper, and by this means obtained a pair with a power, which was absolutely constant, and sufficiently energetic to decompose several metallic solutions, and, among others, that which is employed in gilding by the galvanic way. But this simple means could not be applied, when we desire to produce a greater electro-motive force,—a force, which, as we all know, cannot be obtained but by the combination of several pairs in series. Although the earth is, in both cases, made use of, it is yet evident that the process which I had employed must not be confounded with Prince Bagration's pile, which is susceptible of much greater energy.—*Electrical Magazine.*

ON THE EXISTENCE OF TWO OPPOSITE CURRENTS OF ATTENUATED MATTER IN THE VOLTAIC ELECTROMOTOR.

Experiment of Prof. Ab. Francesco Zantedeschi (communicated to the Venetian Athenæum, 8th Jan., 1844).

The opinions of philosophers are still divided, as to the transport of ponderable matter from one pole to the other of the voltaic electromotor. There are some, as Grotthuss and Martens, who are of opinion that it is only *apparent;* there are others, on the contrary, who admit that it is *actual.* This diversity of opinion owes its origin to the great deficiency of positive proof. An experiment, which our Brugnatelli devised, at the end of the year 1800, demonstrates the actual transport of matter across the liquid, which is interposed between the poles of the voltaic apparatus. I have seen gold amalgamated, when it was immersed in water, at the distance of more than six lines from the mercury. To this experiment, made in 1816, may be added that of Porret, who observed the transport of water from the positive to the negative pole; this was analyzed, in 1825, by De la Rive; and, finally, there is Becquérel's experiment, on the regular movement of light bodies floating on the water, from one pole to the other. However, we must not forget that, in our own times, the secondary polarity of the connecting wire and of the liquid interposed between the poles, has been investigated; and that Dr. Hare and Prof. Silliman have observed that, between the two charcoal points, at which the voltaic spark is manifested, there is a transfer of pulverised carbon, directed from the positive to the negative pole; and that Dr. Fusinieri, from the united results of several observed phenomena, shows that the force of the attenuated matter must be also the principle common to the two electricities, and that the action of the new force is concerned in the production of the electric and magnetic effects. Now, I have experimentally demonstrated this connection; I have also discovered the two opposite currents of attenuated matter, from one pole to the other; and I have detected its nature, if I may use the term, by its action. In the mean time, I will describe the arrangement of the apparatus, and the cautions which must be observed in these experiments, and the effects to which I would direct attention.

The apparatus that I shall adopt in these experiments, is the following, which I have described in my Treatise on Electrotype.—It consists of two cylindrical vessels of very transparent glass. The external one is 13 centimètres (5 in.) high, and 9 (3½ in.) wide, and contains pure water and the zinc plate. The inner cylinder is 9 centimètres high (3½ in.), and 5 (2 in.) wide. At one end, where the membrane, which forms the bottom, is attached, it expands circularly; and its diameter is 8 centimètres (3 in.). This vessel is nearly filled with a very concentrated solution of sulphate of copper; and in it the negative plate, which is of copper, is immersed. The circuit is formed, in the usual way, by means of binding-screws. I have said that I made use of pure water; but more frequently I used that from the cisterns of Venice. Other common waters lose their transparency under the action of the battery; so that we are not able to see what is going on within the water. For the same reason I do not employ acid; or else I only introduce a single drop. The effervescence from the chemical action takes away the transparency of the liquid, and gives it such a character, that, on account of the agitation, there is no possibility of distinguishing any regularity of effect. The water in my apparatus remains apparently tranquil, and very transparent to the naked eye; except that here and there it is occasionally traversed by a few bubbles of hydrogen. Great care must also be taken that the membrane be very perfect, and not in any way to permit the passage of the liquid which it contains. If the experiment is to be carried on in the day time, the apparatus should be placed opposite to a window, exposed to a good light; and with a good lens, the liquid must be looked through in the direction whence the light comes. If the experiment is to be made at night, a wax taper may be used, in place of the light of the sun: experience will teach the experimentalist the mode by which he may obtain the greatest field of light and distinct vision.

Suppose now that in the external vessel there is nothing but the purest water, and in the internal nothing but solution of sulphate of copper: as soon as this vessel is introduced into the other, and the membrane is in contact with the two liquids, the sulphuric acid traversing the membranous diaphragm enters into the water; sometimes under the appearance of films, with thick sides, or with linear expanses at the edges of the films; at other times, under the aspect of filaments having a sinuous and undulatory motion, and swelling at the extremities, not unlike falling drops; and these filaments, when carefully observed, are composed of other very fine filaments, all endowed with a peculiar movement of their own. If the apparatus is left to itself, and the solution is always kept saturated by means of crystals of sulphate of copper, at the end of about three days, the solution will be found to have risen 15 millimètres (½ in.) above the original level; and, in the mean time, the water in the external vessel will have acquired a colour. There will be then endosmose and exosmose, with the particular phenomena of the escape of the sulphuric acid in the form of films and filaments. Sig. Fusinieri, who saw these phenomena in my house, advised me to reverse the arrangement of the liquids. I poured into the external and inferior vessel the solution of sulphate of copper; and within it I placed some pieces of the said sulphate, so that the solution should always remain saturated. In the internal and upper vessel, I poured water from a good cistern, and as soon as the membranous diaphragm was in contact with the solution, the sulphuric acid appeared darting in the form of films or of bundles of filaments, with so much force as to arrive at the surface of the water and agitate it. Here these jets, divide not unlike a fountain of water does, when it reaches its maximum height; the expansion and breaking into films and filaments causes an agitation in all directions, both horizontally and perpendicularly. This peculiarity merits all the attention of the philosopher, because it shows that the ascending jets are continued in the form of fasciculi or films with thick sides, even when they attain the horizontal level, by an intrinsic force which overcomes that of gravity, or specific weight, or the mechanical action of the superposed water which presses on them. If an effect of attraction existed, it would not be possible to obtain it in filaments, or films with thick lines at the boundaries; we should have to divide and subdivide progressively in all directions, *ad infinitum.*

Having, by these means, obtained a clear view of the phenomenon, and having seen that it is of the class of those that are included in Sig. Fusinieri's expansive force, I replaced the water in the outer vessel, and within it I placed the zinc plate. And in the inner vessel I replaced the solution of sulphate of copper, which is always kept saturated, by the mode I have mentioned; and in this I put the copper plate, the circuit being completed as usual. At the end of three days, the phenomenon of endosmose and exosmose is also manifested; but the rise of the solution was this time less than about four millimètres. The experiment was repeated three times with constant effect. The temperature was about 11½ R. (58 Fahr.). My apparatus was, therefore, a *differential endosmoscope.*

I should mention that, according as the circuit is completed, the jets of acid were more copious and quicker, and that it spreads itself in a normal direction at the bottom of the zinc itself. I have occasionally observed that the acid rushes from the membrane with such force as to agitate the water, and carry with it light bodies which lie in its course. And thus I have seen explosions, as it were, occur on the lower surface of the zinc.

The latter has its lower surface covered with pitch. I have witnessed the expansion of the acid, its darting in all directions from the particles of pitch, and its rushing principally in the direction toward which the acid current tends. The mass of water is traversed with the greatest rapidity, moving obliquely to the level of the horizon; and, on the upper surface of the zinc, I have often seen that the spheres, in which the filaments of acid terminated, are struck by the return movement, as in the other experiments which Dr. Fusinieri has investigated. Thus the matter was attenuated, and reduced to a state of elasticity.

On bringing the lens near to the zinc, I have seen that on its surface, it was here and there covered with bubbles of hydrogen gas, which had the appearance of brilliant dew, some of which rise, in the form of drops, through the water, and attach themselves to the surface of the membrane. But in the field of the surface of the zinc, I have seen amongst the adhering bubbles an immense number of points, consisting of a very fine matter, which appears like a white powder, and which, as it separates itself from the zinc, becomes reduced to an exceedingly fine powder. These jets and currents carry with them the light bodies with which they meet in their course. The variations of form which were manifested, when they were well illuminated by the light of a candle, were to me a most beautiful sight.

When the lens is removed to a certain distance, so as to have some parts of the membranous diaphragm on the plane of distinct vision, an innumerable quantity of similar points are seen, consisting of very attenuated matter, resembling a white cloudy powder, which, by its progressive division, is attenuated *ad infinitum.* These jets carry with them the light bodies that occur in their course. Thus we have light bodies ascending and descending. I made a comparison between these two currents of attenuated matter; the ascending one appeared greater, and endowed with a quicker movement than the descending; they both relax their movements as the circuit is opened; and, on the other hand, accelerate it as the same is closed. On breaking the circuit, the little bodies seem to remain neutral and suspended; and on making the circuit, they seem reanimated by a new and vigorous motion.

From all this I gather, 1st,—that, in the constant battery, the phenomena of endosmose and exosmose occur, which are modified by the voltaic electromotive action; 2nd,—that the acid is carried from the negative to the positive pole in the form of films and filaments; 3rd,—that, besides the oxidation of the zinc, and the development of hydrogen gas, there exist two contrary currents of attenuated matter, which differ from each other, both in quantity and in motion. The reciprocal transport, then, of ponderable matter, from one pole to the other, according to these experiments, is no longer hypothetical; but it leaves the existence of one or more imponderable fluids distinct from ponderable matter, still hypothetical and improbable.

If an opinion upon the nature of these two opposite currents of very attenuated matter be not too premature, I should say that one is original, or the source of *action,* and is that which is directed from the zinc to the copper, and the other is derived from *reaction,* and is that of *induction;* it is that directed from the copper to the zinc. It appears to me that this mode of viewing the matter accords with all the phenomena of mutual action, and that it is exceedingly fitted to explain all the chemical phenomena of the voltaic electromotor.—*Electrical Magazine.*

RESULT OF THE ELECTRICAL EXPERIMENTS OF MM. PALMIERI AND SANTILINARI.

LETTER FROM M. MELLONI TO M. ARAGO.

[Comptes Rendus.]

When I announced to you, a few months ago, the researches of MM. Linari and Palmieri on the induced currents of the earth, and the new results which they had obtained, that is to say, the shock and the decomposition of water, I hoped that, as they pursued their experiments, these two philosophers would sooner or later obtain the electric spark, by the action of the terrestrial globe on their pile, or *magneto-electro-telluric** battery. This hope has just been realized more speedily and more easily than could have been anticipated. Indeed MM. Linari and Palmieri have neither augmented the number nor varied the structure or dimensions of their elements which are still composed of cylinders of hollow iron, enveloped by seven superposed spirals of copper wire, covered with silk; they have merely given these elements a very rapid rotatory motion, by means of a good system of toothed wheels constructed by our skilful mechanician M. Baudieri. The mode by which they produce the spark is the same as that of Clarke's machine, which, as you know, consists in plunging for an instant into the mercury one of the opposite points of a little metallic piece fixed on the axis of rotation; every time that the electro-magnetic force attains its maximum of intensity, which happens in MM. Linari's and Palmieri's apparatus, when the elements are in the direction of the dipping needle, and one of the extremities of the wire communicates with the metal piece, while the other is in connection with the mercury. As the cylinders of iron which carry the copper spirals, form a parallel series, it is easy to conceive that their rotation must take place round an horizontal line, perpendicular to the plane of the magnetic meridian.

The electric spark obtained by MM. Linari and Palmieri is feeble, but is perfectly visible in the dark; I have myself perceived it very distinctly several times, so also have MM. de Luca, Semmola, and several other persons. To remove the doubts which might arise as to a pretended disengagement of electricity or of luminous heat due to the friction of the axis or of the air, or from any other cause different from that which forms the object of the experiment, it is sufficient to turn the metal piece a quarter of a circle, so that its points may plunge into the mercury when the axes of the elements are perpendicular, to the direction of the dipping needle; for then, not the least trace of light is produced, whatever velocity may be given to the rotating machine. The light then, which is observed in the normal arrangement of the apparatus, is undoubtedly due to the electro-magnetic induction of the terrestrial globe upon the cylinders of soft iron, and from their reaction on their copper envelopes. It is even superfluous to put the straight line which passes through the two points of the metal pieces, exactly in the direction perpendicular to the plane containing the axis of the elements of the battery, for the spark becomes insensible, however little it is removed from this plane; and this may be conceived, because the displacement, feeble though it be, considerably diminishes the inductive action of the earth; now, as the spark has a very low intensity, there is no reason for astonishment, if it becomes invisible when reduced to a small fraction of its primitive value.

Finally, the first step is made, and we cannot doubt but that authors will succeed in drawing much more brilliant sparks from the electro-magnetic induction of the globe, if they will first take the pains to determine *the proper tension of the current, on the dimensions of the copper wire rolled into a helix, necessary to make the spark shine forth;* and if they then increase the *quantity* of electricity in motion, by means of a sufficient number of these helices furnished with their cylinders of soft iron, and *summed* together by the union of their homologous extremities. It even appears probable, from some of the experiments that were tried, that MM. Linari and Palmieri will obtain the spark with the helices alone, without the cylinders; it being understood that, in this case, it will be indispensable to give them a much greater diameter, especially in the direction perpendicular to the axis of rotation; the experiment will then leave nothing further to be desired.

Meanwhile, the observer, who ardently cultivates the physical sciences, cannot fail to experience a lively feeling of satisfaction, in perceiving for the first time the electric light developed by the magnetic induction of the earth. The ingenious experiments of Ampère have prodigiously extended the field of analogies between electric currents, magnets, and the magnetic action of the terrestrial globe. The fact established by MM. Linari and Palmieri, while it is a consequence anticipated by the brilliant discoveries of Faraday, puts the last seal of evidence to the principle of the identity of the electro-dynamic action of magnets, and of the force which produces the constant direction of that exceedingly valuable needle which, in cloudy weather, is the sole guide to the navigator in the midst of the immense solitudes of the ocean.—*Electrical Magazine.*

* Vide Elec. Mag., No. 2, page 80.

TERRESTRIAL ELECTRICITY.

By JOHN JOSEPH LAKE.

THE EARTHQUAKES OF 1755.

The earthquakes commonly known as "the Great Earthquake of Lisbon," having been adduced as a proof that electricity has nothing to do with the production of such phenomena, it is particularly necessary they should be considered especially as they will be found to support the opposite theory.

During 1750, and the four following years, there appears to have been a disturbance of the usual passage of the electric fluid which occasionally discharged itself, producing the tremors of the earth that were felt during that period. The state of many strata was also altered, during the same time, by a great drought that prevailed, which reduced the conducting power in a greater or less degree of those strata that require moisture to render them suitable for the purpose. The fatal year, 1755, however, was very wet, and as some strata are more porous, and absorb moisture quicker than others, one would have its conducting power renewed long before another. This, if fluid had gathered, would accelerate, and even produce shocks of earthquake, for the barrier opposed to the progress of it would be weakened, and an alternation of good and bad conducting strata be produced.

On the 31st of October, the day previous to the fatal event, the presence of electric fluid was denoted at Lisbon by a remarkable gloominess that prevailed in the atmosphere, which obscured the sun; and at Colares, at 4 P.M., a fog came over the sea, and the latter rose with a prodigious roaring.*

The 1st of November began at Lisbon with a thick fog, which was soon dissipated by the sun. The weather was remarkably warm, an universal stillness prevailed, not a breath of wind stirred, nor was there the least agitation of the sea. In the midst of this quietness, the catastrophe began.

At Colares, twenty miles from Lisbon, the same morning broke with a serene sky, but *about*† 9 o'clock the sun grew dim, and a noise like that of chariots was heard, which increased until it equalled the roar of cannon, and immediately a shock of earthquake was felt.

The probability of the wet weather of 1755 producing an alternation of good and bad conducting media in the earth, has been spoken of; but whether this produced them or not, the effect of such a series was distinct, and denoted by a noise as of chariots running.*

The shocks at Lisbon seem to have been felt rather later than at Colares, being at 35 minutes past 9, A.M. The first shock raised up the earth, as would be the case on the occasion of a subterranean electric discharge. This is proved by the bar being laid dry from shore to shore, the bed of the Tagus rising in many places above its surface, and the retiring of the sea. When the earth fell in again the sea returned, rolling like a mountain, and, by the impetus it had obtained, went inland, and rose to the height of 50 feet near Belem Castle.

The shock also came on with a rumbling subterranean noise, which, with the attendant circumstances, explains the effects observed at Colares. The shocks were at first short, and in quick succession, as through a series of insulated conductors, producing the noise heard at Colares as of chariots. This noise changed, and increased until it equalled the roar of cannon, when the conducting media were further apart, for then the discharges were more violent.

At Funchal, in the island of Madeira, the shaking was felt at the same time as at Lisbon, and the phenomena indicated an electric discharge. It lasted only one minute, and was preceded by rumbling noises in the air, as of empty carriages. The noise accompanied the shock during the whole of its continuance, and lasted some seconds after the motion of the earth ceased. An observer described it as "dying away like a peal of thunder." There is not information enough recorded to explain how the discharges produced the noises in the air, but it is sufficient that it was of electric, and not of volcanic origin.

The shocks were felt simultaneously in many places, as Lisbon, Madeira, and Great Britain; and it appears highly probable that a wave of earthquake moved from these points, similar to the tide wave of the ocean and atmosphere. But the accounts on record only enable us to trace it from the neighbourhood of Lisbon. It appeared at Ayamonte, in the bay of Cadiz, "a *little before* 10 A.M.; at Arzetta, in Fez, and Tangier, *about* 10 A.M.;" at Gibraltar and Madrid simultaneously, but "not *till after* 10." It can also be traced at sea as well as by land. At Ayamonte the sea came in in great waves "in *little more* than half an hour after the shock," though the day was serene, and not a breath of wind stirring. At Cadiz, at 10 minutes after 11 A.M., a wave came in from the sea at least 60 feet higher than usual, and at half-past 11 another. At three quarters past 11 A.M. a great wave came in at Funchal, the draught of which, on its approach, drew the water several feet from the shore, and the sea retired and returned four or five times, both here and at other places in Madeira.

If space permitted, many other curious phenomena might be brought forward and explained; none, however, having any resemblance to volcanic action, it does not appear necessary to allude to them.† But the following must not be

* The sea was affected during the earthquakes in Calabria, in 1638.—*Pharmaceutical Number, Medical Times*, June, 1844.

† Much difficulty occurs from the loose manner in which the time, and many circumstances connected with earthquakes are recorded, as will be observed in the progress of these remarks.

* *Pharmaceutical Number, Medical Times*, June, 1844.

† The following are remarkable, and were produced by the vertical movement of the ground, as may be proved by taking a basin partly filled with water, and suddenly raising or sinking it: the water will sink or rise in the middle or at the sides, and continue to do so until it gradually subsides. Near Durham, "about half an hour after 10," a rushing noise was heard to issue from a pond, and its waters were seen to rise and descend alternately during five or six minutes, making four or five such vibrations in a minute. At Eaton Bridge, Kent, the water of a pond opened in the middle, so that a post in it was seen almost to the bottom, and the water dashed over a bank two feet high, and perpendicular to the pond; this was repeated several times with great noise. At Loch Lomond, in Scotland, "about half an hour after 9 A.M." the water, without any apparent cause, rose against its bank with great rapidity, then subsided far below the usual level; it rose again

passed over. Captain Clark, from Dienna, lat. 36° 24′ N., between 9 and 10 A.M. had his ship shaken and strained as if she had struck on a rock, so that the seams of the deck opened, and the compass was overturned in the binnacle. The master of a vessel bound to the American islands, being in lat. 25° N., long. 40° W., and writing in his cabin, heard a violent noise (the electric discharge), and, while asking the cause of it, the ship was put in a strange agitation as if she had been jerked up and suspended by a rope at the mast head (the effect of the upheaving of the bottom of the sea communicated to the water). On looking out of the cabin window he saw what seemed to be land about a mile distant, but coming upon deck, the land was no more to be seen; he, however, perceived a violent current across the ship's way to the leeward (which was the return of the water that had been displaced by the elevation of the bottom of the ocean). In about a minute this current returned with great impetuosity (through a second elevation of the bottom), and at a league's distance he saw three craggy-pointed rocks throwing up water of various colours *resembling* fire. This phenomenon ended in about two minutes in a black cloud, which ascended very heavily. After it had risen above the horizon no rocks were to be seen. Between 9 and 10 in the morning another ship, 40 leagues west of St. Vincent, was so strongly agitated that the anchors, which were lashed, bounced up, and the men were thrown a foot and a half perpendicular from the deck. This also was from the upward movement of the bottom of the ocean communicated to the water. Immediately after this the ship sunk in the water as low as the main chains. The lead shewed a great depth of water, and the line was tinged with a yellow colour, and smelt of sulphur. The shock lasted about 10 minutes, but smaller ones were felt during about 24 hours after the first.

Though the shocks were felt in Great Britain, Sweden, Norway, Germany, Holland, France, the Peninsula, Italy, Switzerland, Antigua, Barbadoes, and other places; these, and some smoke that ascended from the hill Fojo, near Colares, are the only appearances at all volcanic. Of the smoke, very thick but not very black, at the latter place we can make nothing, for on visiting the spot whence it proceeded no sign of fire could be perceived near it. But the phenomena in the neighbourhood of the West Indies merit a short consideration.

The fire seen in lat. 25° N. does not seem to have been flame; for it is described as "*water of various colours resembling fire,*"* and its duration about two minutes. This had every appearance of being electrical for the following reasons:—The fire, or appearance of it, seemed to exist in the water itself, and most probably arose from the sulphur and other colouring matter, and weeds† raised with the rocks from the bottom; or it might even be occasioned by electric excitation produced by the passage of the rocks through the water; for, as the motion of water against a body produces it, so the rapid motion of a body through water has, there is every reason to suppose, the same effect.* Certain it is that neither flame nor fire can exist in water. It is also to be observed that no volcanic or burnt matter of any kind, as pumice stone and ashes, were found; no steam, either, appears to have been generated, which, if fire had been present, would have been the case. Taking, therefore, all the circumstances into consideration, the only explanation that can be given of the smoke is, that it originated from the combustion of sulphur and other inflammable materials by the electric discharge, the power and magnitude of which are shewn by the rocks forced to the surface of the Atlantic Ocean; for if it had been produced by the breaking forth of subterranean fire, lava, pumice stone, or other calcined matter would have been found on the hill Fojo, or floating at sea. Nothing of the kind, however, appeared, though the shocks were felt from Norway to Madeira, and from the West Indies to Italy.

ON THE DIRECTION OF ELECTRIC CURRENTS, AND THE CAUSE OF THE MAGNETIC NEEDLE POINTING TO THE NORTH.

We have seen that the electric fluid is in greater intensity in mountains and elevated regions, and that there is a constant current of it flowing towards the tropics. But on account of the repulsion from the opposite side of the earth, a current of fluid will not descend into valleys so long as it can find a conducting medium in mountains or high lands. The electric fluid, therefore, flows in preference along the latter, and the general direction of its currents must be that of the mountainous and elevated parts of our planet. These are arranged in the following table:—

Name of Country, District, &c.	General Direction of Mountains and High Lands.	
Europe	N.E. to S.W.	(A.)
England		
Scotland		
Norway		
Spain		
Switzerland		
America, North (the Eastern ranges)		
Ireland	NN.E. to SS.W.	
Holland and Belgium		
Sweden	N.E. to S.	
Italy	S.E. to N.W.	(B.)
Austria		
Hungary		
Greece		
America, South		
America, North (the Western ranges)		
Russia (Europe)	N. to S.	(C.)
Denmark		
France	Various.	(D.)
Germany		
Asia		
Africa		

By this table it appears that the high lands of the earth form two lines, of which the one is at right angles to the other; the main direction of the one (A) being from north-east to south-west; that of the other (B) from south-east to north-west. It is also to be observed that A nearly doubles B. To simplify the following explanations, the remaining cases will be passed over, as the influence of C must be comparatively small, and that of D neutralized. Hence, there are two general directions in which the electric currents flow; one on a line drawn from south-east to north-west (B), the other on a line from north-east to south-west (A). As A nearly doubles B, the electric currents along A must exercise a greater influence than those along B. Every electric current is accompanied by a magnetic action at right angles to it, and the north pole of a magnetised needle is always directed to the same side of an electric current. Even if entirely reversed, it will, when left to itself, return to its first position, so long as the current continues.

On this principle, and in this manner, the electric currents of the earth affect the compass. For the currents that flow from north-east to south-west, would cause the needle to point north-west, but the other currents from north-west to south-east prevent this, and would force the needle to point north-east. According to a mechanical law, if these two forces were of equal strength, the diagonal to the directions in which they are exerted would be the direction of the magnetic needle, that is, due north. But when they are unequal, the line of direction will incline towards the side of the weakest force, that is, to west of north, for the electric currents from north-east to south-west are more powerful than those from north-west to south-east. This, then, is the cause of the direction of the needle to the northward on the eastern side of the American continents. The same principle, under different circumstances, produces a similar effect on the western side, which it is now intended to consider.

To the west of America a very large portion of the surface of the earth is water, constituting the North and South Pacific Oceans. Hence, there being no elevations, there is a deficiency of electric currents, and a very small proportion of fluid in that region. It would, therefore, follow, that the currents along the American mountains, all the others being remote, would act very powerfully on the needle and cause it to point towards the south-west when under induction from the northern continent, where the great electric current flows to the south, and towards the north-east when under induction from the southern continent, where the electric currents flow towards the north. But the Great North American current, from north-west to south-east, is neutralized to a very considerable extent by another current along the eastern ranges from north-east to south-west, and this neutralization is completed by the influence of the great currents of the eastern hemisphere. Hence, the South American and other unneutralized currents parallel thereto, regulate the direction of the magnetic needle to the west of America. But they do not altogether govern it, for the eastern currents from north-east to south-west cause it to point much more to the north than would be the case if they were absent.

Hence, the direction of the magnetic needle is not regulated by any particular current of electric fluid, but is the result, in every part of the world, of the general action of all the electric currents of the earth upon it, and, hence, its direction is always to one quarter.*

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and so forth. The greatest perpendicular height of this swell was two feet four inches. A large stone, lying at some distance from the shore, but in such shallow water that it could easily be seen, was forced by the sudden jerk out of its place in the lake upon dry land, leaving a deep furrow in the ground all along the way it had moved. At Barlborough, in Derbyshire, the impulse was diagonal, and from the south. "Between 11 and 12 A.M." a surprising and frightful noise was heard near a large body of water called Pibley Dam. A large swell of water came in current from the south, and rose two feet on the north side of the lake; it then subsided and returned again, and so on, gradually decreasing in its motion, until it entirely ceased. A similar noise, with agitation and overflowing of the waters of a canal, was observed "about half an hour after 10 A.M.," in Busbridge, and also in a pond at Cobham, Surrey.

* Rees's *Cyclopædia*, art. "Earthquake."

† The Red Sea owes its name to its red appearance, which arises from weeds of that colour growing in it.

* A remarkable instance of the appearance of fire was observed by Don Juan de Castro in the Red Sea. It is thus alluded to by Lord Valentia, in his Travels, vol. ii. p. 246:—"We were astonished, when in twenty-two fathom, with the white appearance of breakers; when the captain immediately let go the anchor. The pilots declared that it was only fish, and so it proved, for soon afterwards they approached and passed under the vessel. It is singular that the same circumstance should have been observed by Don Juan de Castro, and should have had the same effect of inducing him to let go his anchor. He does not account for it, because it happened in the night, but he mentions that it cast flames like fire." His lordship considered it to result from fish spawn, but if so it would not have advanced and passed under the ship. Since the discovery of electric excitation by the motion of water, I am inclined to consider that it resulted from the passage of fish through the sea. And also to refer the sparkling of the ocean to the same principle.

* "All the variations at night were towards the east (I have since observed a slight variation in the needle at night, but this seems to be of rare occurrence), whether the Aurora was actually visible or not; and hence may we not conclude, taking it for granted that it is an electrical phenomenon, that it usually moves from about the north

The difference between the horizontal, and dipping or vertical needle, is entirely in the mode of suspension; for if the latter were suspended to act horizontally, it would shew the same effects as the horizontal needle, and so the horizontal needle, if suspended to act vertically, would shew the same results as the other.

It was observed by the Rosses, on their second voyage to the Arctic regions, that in lat. 70° 5′ 17″ N., long. 96° 46. 45″ W., the spot named by them "The North Magnetic Pole," the horizontal needle ceased to traverse, but remained in the position in which it was placed, even when suspended by a single fibre of floss silk or flax.* This resulted from that spot being the centre balance or vortex of the electric currents of the earth, or that part of the surface nearest to it, and the magnetic needle being sufficiently near to this centre or vortex to have its action neutralized by the balancing influence of the several currents when suspended horizontally. This neutralizing effect upon the horizontal needle extends a great distance from this spot, for off Cape York, in lat. 73° 40′, when the motion of their vessel became considerable, the compasses (Popc's, Gilbert's, and Alexander's,) ceased to traverse. It is even felt on the St. Lawrence; so much so, that the sluggishness and uncertain variation of the compass assist greatly to render the navigation of that river difficult.

At "The North Magnetic Pole," where the action of the horizontal needle ccased, the dipping or vertical ucedle indicated 89° 59′, or within 1′ of the vertical, and it is highly probable that the instrument did not shew 90° for want of some nicety in construction, which had not previously been required. This intense action of the dipping needle shews that the spot was over the centre or vortex of the electric currents, and that they acted upon it from every side with the same intensity.

As the direction of the magnetic needle arises from the action of electric currents, and as the latter are affected by the sun, it follows that the sun influences the action of the former through them. Hence the fluctuations noticed by Mr. Fox.

Besides the daily, there is another irregular change constantly going on in the direction of the needle, from geological alterations changing the direction of electric currents, and these are greatly promoted by earthquake and similar convulsions. The variation was formerly east of north, in the eastern hemisphere, but it is now to the west. Thus, in 1576, the variation at London was 11° 5′ E., and, in 1612, 6° 10′ E., making a change of 4° 55′ in thirty-six years. During the same period, in 1586, a mountain near Panacura, in Java, was shattered in pieces by a violent eruption of glowing sulphur, and in 1600, there was an earthquake at Arquepa, in Peru, when a volcano broke forth, accompanied with an eruption of sand, ashes, &c., which continued during twenty days. The sand and ashes covered the fields ninety miles one way, and one hundred and twenty another, varying in depth from a quarter to two yards, shewing the violence and extent of the internal commotion. There are no records of any similar convulsions during the next ten years, and in the course of the same period the variation changed only 10′, being 6° 10′ E., in 1612, and 6° E. in 1622. But the next twelve years brought about a change of 1° 55′, and on the 16th of June, 1628, there was an earthquake in the island of St. Michael's, one of the Azores, near which the sea opened, and in one place, where it had been 160 fathoms deep, an island was thrown up, which, in fifteen days, was three leagues long, one and a half broad, and 360 feet above the water. In 1631, there was an eruption of Vesuvius, and in 1632, rocks were thrown three miles from it. In 1634, the variation was 4° 5′ E., and, in 1657, the needle pointed due north, so that in twenty-three years there was a change of 4° 5′. During this period occurred the earthquakes of Calabria, in 1638, and in 1646 many of the Andes were quite swallowed up. So, ever since, the change of the variation to any extent has always been accompanied by internal convulsions of the earth.

towards the south, that it must be of the nature of positive electricity? And, by a parity of reasoning, may we not assume the existence of an opposite state of electrical action by day, in order to account for the westerly variation, which is most considerable in summer in these latitudes, when the Aurora prevails about the South Pole? This idea seems to be strengthened by a fact I have noticed, that the magnetic intensity is usually less considerable in summer before the middle of the day than it is afterwards; so that the minimum intensity commonly occurs some hours before the maximum temperature."—On the Variable Intensity of Terrestrial Magnetism, and the Influence of the Aurora Borealis upon it. By Robert Were Fox.—*Philosophical Transactions* (1831), p. 199.

* "On the Position of the North Magnetic Pole," by Commander James Clark Ross.—*Philosophical Transactions* (1834).

HUMAN SUSCEPTIBILITY.

[From the "Boston Medical and Surgical Journal."]

SIR,—I find the following paragraph in the last number of your journal, which I quote for the purpose of accompanying it with a few remarks :—

"*Rare Physiological Impressibility.*—An author of a work on medicine, who resides in Boston, assured us, recently, that he had produced a cathartic operation in a most convenient manner, viz., by simply putting one drop of a purgative tincture into an ounce phial filled with water, which, when held between the thumb and finger, although corked tightly, produced all the effects which the same medicine would have accomplished had it been taken into the stomach! Now, we verily believe that the gentleman who related this extraordinary circumstance, honestly stated what he considered to be strictly true, notwithstanding that it is opposed to all the analogies of nature, pathological laws, the experience of medical men, and the sound dictates of common sense."

It is known to some of my friends in Boston, that for a year or more, at the suggestion of Dr. Buchanan, I have been making numerous experiments with medicines upon persons of a susceptible temperament, with a view to ascertain their precise and varied action upon the human system. As yet I have published nothing upon the subject, and in alluding to it the other day, in a desultory conversation with you, it did not occur to me that any notice would be taken of it in the pages of your journal. This having been done, however, I beg the privilege of saying a few words in reply, as there is a possibility of some of your readers identifying me with the paragraph.

By the way, I did not say that I had produced a cathartic operation in the way that you have described, or in any other way, for I do not employ cathartics in my practice. I stated that in my experiments upon susceptible persons, I was able to produce all the effects of a medicine by putting a drop of the concentrated tincture into a small phial filled with water, and giving it to the subject to hold between his thumb and finger. You wished to know if a cathartic operation could be produced in this way, to which I replied in the affirmative, for I have frequently recognised a tendency to catharsis in experimenting with cathartic substances. In a similar use of emetic substances, also, where I have not duly estimated the susceptibility of my subject, I have sometimes occasioned vomiting.

That catharsis may be produced as already mentioned, ought not to appear extraordinary to any medical gentleman of extensive reading, nor do I see wherein it is "opposed to the analogies of nature, pathological laws, the experience of medical men, and the sound dictates of common sense." Let us notice some of these analogies.

The Calmucks can distinguish whether a fox be in his hole or not by the smell. "The guides between Smyrna, Aleppo, and Babylon, when traversing the desert, ascertain distances by the smell of the sand." The deaf and dumb boy, mentioned by Dugald Stewart, identified persons by their odour, and such was the effect produced upon him in this way, that he would form a sudden attachment or dislike to strangers. Caspar Hauser could distinguish apple, pear, and plumb trees from each other at a considerable distance by the smell of their leaves. In passing a graveyard, the smell of the dead bodies, though it must have ascended through many feet of earth, had such a powerful effect upon him, as to produce rigors, followed by great heat, copious perspiration, and other violent symptoms.

It is well known that persons of a high degree of susceptibility have been killed by the odour of a flower. Bulbous plants are proverbial for causing giddiness, headache, and fainting. Bishop P., of one of the western States, is so sensitive to the influence of brass, that the merest touch of the metal, though unconsciously, will produce disagreeable sensations and a brassy taste in his mouth. A lady was under my treatment who could not endure the odour of a solitary flower in her chamber, and such was the effect of coffee upon her, that the family was obliged to give up its use, for the preparation of it in the kitchen, far removed from her presence, would affect her very powerfully, There is another lady under my treatment at the present time, who cannot walk upon a recently-painted floor, though her feet be protected by shoes, without her feet swelling, and experiencing a disagreeable effect upon her whole system. She discovered this peculiarity more than ten years ago, but never mentioned it to her friends, as she supposed it would excite their laughter or ridicule. She spoke of it to me, upon my discovering that she was powerfully affected by a very minute dose of medicine.

Medical men acknowledge that a letter, a handkerchief, or any similar article, may produce a pestilential disease, after having been transported a great distance from one country to another. Though this may be classed among the "extraordinary" facts in medicine, it is not disbelieved, even by sagacious physicians, on account of its incomprehensibility. Malarious diseases are supposed to have their origin in a subtle poison contained in the atmosphere, which the chemist, with all his knowledge and skill, is incapable of detecting. Persons are frequently poisoned by passing in the neighbourhood of the *rhus toxicodendron*, or even by shaking hands with those who have been near this tree.

It does not appear to me that even the "experience of medical men," of which you speak, will go very far to sustain you in the position you have taken. To prove this, I need not trave beyond the pages of your own journal. You speak editorially of a case of smallpox, produced by bank bills, which the deceased was obliged to handle during life. Now it may seem very "extraordinary" that the poison of smallpox should attach itself to a bank note, so as to communicate the disease, and yet this appears to have been the truth. One of your correspondents, Dr. Turner, who is very susceptible to the influence of *ipecac.*, says that a "bit of paper in which a Dover's powder had been wrapped, or stepping into a physician's office, or even coming in contact with his clothing, has often caused a paroxysm of suffering sufficient to arrest him in the midst of his business." The effects produced consist of asthmatic sufferings, which continue for weeks, preventing a recumbent position, and reducing the strength as rapidly as an ordinary fever. If coming in contact with a physician's clothing, who is in the habit of using *ipecac.*, will occasion such results as these, I think it will cease to be a matter of wonder that I should affect a susceptible person with a drop of medicinal tincture, as already stated. Dr. Turner thinks that cases like his are probably numerous, and mentions four which have come under his own observation, so that such instances of "physiological impressibility" do not appear to be so "rare" as might be imagined.

It may seem improbable that the influence of a medicine can be transmitted into the human system through a glass phial, and yet a long series of experiments upon susceptible persons has convinced me of the fact. I have experimented with

a great variety of medicines, and have found that the effects produced were peculiar to the medicines, and therefore feel assured that I have not been made the dupe of my senses. Is this fact any more curious, however, than that electricity or galvanism should traverse an iron wire, or any other conductor? Every medicinal substance appears to possess a sphere peculiar to itself, or in other words evolves some imponderable fluid for which I have no name, but which is capable of pervading the whole system, and producing effects peculiar to the medicine from which it is given off. That this is the truth, cannot, I think, be reasonably doubted, or I should be unable to produce any effect upon my subjects; and that I do produce an effect is not improbable in theory, and is abundantly demonstrated by experiment. There are, I admit, but comparatively few persons possessing sufficient susceptibility to admit of their being influenced by a medicine through a glass phial; but there is a large number who are much more easily influenced by medicinal agents than physicians generally imagine, and unless this is taken into the account, we may injure or prostrate our patients without being able to assign any cause. It is to persons of a susceptible temperament that *homœopathy* owes its reputation, and the votaries of this new doctrine are frequently unsuccessful in their practice, because they believe, or affect to believe, that all patients may be influenced equally alike by their infinitesimal doses. I suspect that there is a much greater degree of susceptibility in Germany than in this country, on account of climate, or some other cause, which enabled Hahnemann to obtain results with his inconceivably small doses, denied to his strenuous partizans in the United States.

The mode of investigation I am pursuing, I regard as an ample key to the Materia Medica, and I am preparing a volume upon the subject, which I shall issue as soon as convenient. My experiments have convinced me that every medicine operates in a manner peculiar to itself, producing certain specific effects upon the various organs and parts of the body, and that a remedy, to be successful, must be selected strictly in reference to its specific powers. The changes which medicines produce in the mental condition of a patient, I have found to be most curious and instructive, and worthy of much greater consideration than the subject has heretofore received. The fact that certain organs or tissues of the body have an affinity for particular medicines, has been recently admitted in France, and has received the sanction, if I mistake not, of M. Orfila. Where antimony, for example, has been introduced into the body, it has been found in the liver, spleen, and urine, and not in the lungs, heart, brain, muscles, or bones. I might pursue the subject farther, but I am afraid I have already trespassed too long upon your patience.

Boston, May 20th, 1844. M. Mattson.

CAUSE OF COLOUR IN THE HUMAN FAMILY.

By G. W. F. Mellen, Esq.

Agreeably to your request, I send you my observations on the cause of colour, as it appears in the different varieties of the human race. In so doing, it is with some diffidence I appear before the scientific readers of your Journal, and particularly as the idea I shall advance is one that was suggested to my mind, as a deduction from certain facts that had already been discovered, and not one that I have seen brought forward by any writer with whom I am acquainted; saving that, as a general observation, most persons attribute the cause to the climate, without pointing out either the why or the wherefore—while, on the other hand, many, distinguished in the literary and scientific world, have attributed the cause to some freak of nature, a *lusus naturæ*, or accidental circumstance, or a direct interposition of the Deity.

In casting our eye at the lower animals, we find that they are all fitted for the climate and the circumstances under which they are placed. We have elephants covered with hair, and those that are not; we have the black and polar bear; the rabbit, changing the colour of his fur in winter and summer; we have the cider covered with down, and birds whose feathers change, or do not at times afford so warm a covering. Then, again, the lower animals are fitted for the kind of life they lead; the camel and the reindeer could not change places; each is adapted to the place and latitude where it exists. And shall man be less cared for than they? shall he be the only being on the earth, in whose formation a lack of wisdom is displayed? Is he defectively made? Or is it left to chance to determine his colour? Or is there a constant and direct agency at work that moulds the man, and gives him the colour that is best fitted for him, under the circumstances in which he is placed? Judging from analogy, and the care taken of the lower animals, we must come to the conclusion that the latter is the case, that there was but one father of the human race, and that we can see in the varieties of climate on our globe, a sufficient cause why men should differ and differ as widely as they do. The circumstances and the mode of life of no two nations are precisely alike, and the consequence is, a nice observer can distinguish the natives of one from those of the other, let their complexion be what it may. And should not the diversity of climate produce a like result? As a general fact, we find it does. The change of colour is gradual, from the equator to the temperate zones. The Moor is lighter than the Ethiopian, the Spaniard than the Moor, the Frenchman than the Spaniard, and the German than the Frenchman; making, as will be perceived, with some slight exceptions, a gradual succession of changes, from the intensely black to the purest white, as you recede from the equator to the frigid zone.

The cause to which I would attribute the difference in the colour of the different races of men, if I may so speak, is purely chemical; it is by the chemical action of the sun's rays that man is made black, in order to preserve the body of an equal temperature, thereby preserving it in health and strength, and adapting it for the circumstances under which it is placed. No one, who has made any observation on the subject, but must have marked the difference between an individual brought up in the shade, and one exposed to the rays of the sun, even in our climate. The farmer, who goes out and exposes himself to the sun, does not put on the same fair exterior that he does who is confined within doors; in fact, the part exposed will differ from that not so.

It is a well-ascertained fact, that black substances transmit heat much faster than white ones. Water placed in a black vessel, before the fire, will boil much faster than in one that is bright; a piece of black cloth, laid upon the snow, will sink down much quicker than one that is white. Dr. Howard, of England, constructed a differential thermometer, by which he ascertained the comparative difference in the time it took to cool water placed in a tin vessel, six inches cube, when coated over by different substances. Having placed it in a line of the axis of a concave mirror, he placed one of the bulbs of his differential thermometer in its focus, and the following is a general view of the results. Lamp black, 100 deg.; writing paper, 98; rosin, 96; crown glass, 96; China ink, 98; red lead, 80; clean lead, 19; iron polished, 15; zinc plate, 12; gold, silver, copper, 12. That is, the side of the tube that was covered with lamp black, when turned towards the thermometer, raised it 100 degrees, in the same time that it raised it 12 when the side that was covered with copper, zinc, silver and gold was turned towards it. Similar results were obtained by Leslie and Rumford in a similar manner. Vessels, of similar shapes and capacities, but of different materials, were filled with hot liquid, and their rates of refrigeration noticed. A blackened tin globe cooled a certain number of degrees in 80 minutes, whilst a bright one took nearly double the time, or 156 minutes. A naked brass cylinder, in 55 minutes cooled 10 degrees, while its fellow, cased in linen, was 36¼ minutes in cooling the same quantity.

Now, it is well known that the heat of the body is about 98 degrees, and that it cannot be raised or lowered much without injuring its different functions. It is also known that the temperature of the atmosphere, at or near the equator, is between 80 and 90 degrees for the most part of the year, seldom rising above or falling much below; consequently, there is but 8 or 20 degrees difference between the heat of the body and the surrounding atmosphere. It is also known by every one, that by exercise the heat of the body is raised, and consequently, if it had not an easy passage to escape, it would have, when there was so little difference between it and the temperature of the air, a tendency to increase, in such a manner as to produce disease and death.

As this may not be perfectly clear, I will state that among a variety of experiments made by a Mr. Cheruel, on tallow or fat, he found it was composed for the most part of two principles, an oily substance that remained fluid at the ordinary temperature of the atmosphere, and another fatty substance, much less fusible; that one of these substances melts at about 42 degrees, the other at 100 degrees. One of these he named stearine, and the other elain, from the two Greek words "stear," fat—"elain," oil. In determining the melting point of two portions of fat, taken from different portions of the body, he found them to differ, and the variations to take place in different portions of stearine and elain. He found, also, a *difference* in the *melting point* of fat, taken from animals of the *same species*. When portions of fat of different sheep were melted separately at 122 degrees, in some specimens, the thermometer descended to 98 degrees 5,′ and rose again to 102 degrees; while in others it descended to 104 degrees, and rose to 106 degrees The thermometer plunged in the fat of an ox, melted at 122 degrees, descended to 98 degrees 5′, and rose again to 102 degrees. Requiring, it will be perceived, a degree of heat equal to 122 degrees, to melt the fatty portion of the system, while it would remain fluid at 102 to 106 degrees.

In the combinations of these two substances, we see how beautifully they are adapted to keep the body, for its ease and comfort, lubricated and pliable; and it is probable if the one should be melted, and the other congealed, the functions of the body would with difficulty be carried on; and, as I before remarked, exercise producing heat, we see why fleshy people cannot endure so much in a warm day, as those that are spare, and also the necessity there is for the emission of heat from the body, in a climate the heat of which approaches so near to that of the melting point of a portion of our system; and, also, why in the more northern latitudes it should be the reverse.

As a further illustration of this subject, I would observe it has been calculated, by physiologists, that the lungs and skin throw off, during twenty-four hours, from twenty-five to thirty-two ounces of vapour, and that every ounce of vapour thus thrown off, contains 1000 degrees of heat; consequently, there are from 25,000 to 32,000 degrees of heat that escapes in the above time. Liebig says, in his late work, it requires 34,000 degrees of heat to be generated in the human body, to keep it at the temperature of 98 degrees, for twenty-four hours—a degree of heat, if concentrated at one time, on one point, nearly five times greater than that of red hot iron. What would be the effect of retaining such a degree of heat in the system, can be easily imagined.

Now, as the time it takes for heat to pass from one medium to another, is as the difference of the degrees of temperature between the two media, and the facility with which it passes any obstructing substance (that is, the greater difference there is between the two media, and as the obstructing substance approaches to black, the shorter the time taken to throw off the excess, and the reverse), consequently, when one substance possesses 100 degrees of heat, and another 50 degrees, and they are placed in contact, they will, in time, if there is no heat escapes in any other way, become of an average temperature, that is 75 degrees; but it will take double the length of time for the last 12½ degrees to escape, that it did for the first 12½; that is, the temperature of each will become 62½ and 87½, in half the

time that 62½ will become 75, and 87½ be reduced to 75. And, again, as the heated substance is surrounded by a black or white coating, so will the facility of the transmission of the heat be accelerated or retarded; the black accelerating, the white retarding it. Consequently, it will be at once perceived, that when the temperature of the atmosphere approaches so near to that of the human body, and it is so important that all the functions of the frame, for its health, ease, and convenience, should be carried on under a certain temperature, how admirably adapted is the variety of colour observable in the human family, under different latitudes, to effect these objects; and as the laws of nature now are, these objects could not be effected in any other manner, so far as we are yet able to learn.

A common mistake has been made on this subject by many, who, knowing that black transmits heat easier than white, have been unable to account for the black skin in warm latitudes; forgetting, all the time, that the body is warmer than the surrounding atmosphere, and within itself is constantly generating heat, and consequently requires an easy transmission from its surface to keep it in a proper temperature. We consequently never hear of a black man receiving a *coup de soleil*, as is often the case with the white; neither do we hear of the skin of the dark man being scorched and blistered by the sun's rays. But no sooner does a white man expose himself to its influence, than his skin peals, a new one is formed, and the man is tanned. It should also be remembered, we put on clothing not to keep the cold out, but to keep in the heat, or, in very hot climates, we put it on to keep out the heat, and we find the negro, in choosing the white, has chosen the most appropriate.

But this law, that our bodies should adapt themselves to the various circumstances under which they are placed, deserves our attention.

There is something called a living principle, which has as yet eluded, and probably ever will, all observation, and which has a tendency to preserve life in spite of the various causes that would destroy it. For instance, if a man uses his hand, instead of wearing out, as an inanimate machine would do, by use, the hand grows harder and firmer, and by exercise is better able to perform the work to which he would apply it, let that work be light or heavy. And what farmer is there who goes to his work in the fields in the hot months of July and August, that does not show the effects of his exposure, and come back from his employment with a darker skin than he had when he went? It would seem as if light, by changing the skin dark, or what perhaps would be nearer the truth, by causing the skin to secrete, as in the black man it does, a black fluid between the scarf and the true skin, or by changing the chemical nature of the substance between the scarf and true skin, and thereby forming a different-shaped particle that composes the substance here deposited, prepares it for the wants of the body, and consequently the stronger the light and heat, the darker does the body become.

In this connection, I do not mean to say, that the black man, after residing at the north, or the white man after residing at the south, although the skin may retain its original colour, at least in a degree, may not experience inconvenience by exchanging their situations; because, as I said before, the body in some measure adapts itself to the circumstances under which it is placed.

Dr. Ure, a distinguished writer and chemist, of England, says, "evaporation and rarefaction are grand agents employed by nature, to temper the excessive heats of the torrid zone." Again, "the equilibrium of animal temperature is maintained by a copious discharge of vapour from the lungs and skin. The suppression of the exhalation is a common cause of many, formidable diseases, among these fevers take the lead. The ardor of the body in this case of suppressed respiration, sometimes exceeds the standard of health 6 or 7 degrees. The direct and natural means of allaying this morbid temperature, were first systematically enjoined by Dr. Currie, of Liverpool. He showed that the dashing or effusion of cold water on the skin of a fever patient has most salutary effects, when the heat is above 98; and when there is no sensitiveness of chilliness or moisture on the surface." Arguing, undoubtedly, as he might, that as the whites in the southern latitude were more subject to fevers than the blacks, and that this might be owing to the different degrees of facility with which the heat was conducted from the body, and as evaporation had a tendency to lower the temperature of substances from which it should take place, so, by applying cold water immediately to the skin, he could effect, by artificial means, what nature did by hers. Professor Silliman, in one of his late lectures in Boston, alluded to the same provision of nature. Evaporation from the body of the white man, in the torrid zone—is what helps preserve the body in a state of equilibrium and of health; while the evaporation of vapour and the easy transmision of heat through the black skin, combined, preserve the equilibrium and tealth of the blaek man, and by these means he is doubly guarded.

It may be objected to my position, if the colour of the skin is owing to the climate, why are the Indians of this country, in these northern latitudes, black or red? Why are they not as white as the European? Why are not the Esquimaux, and the inhabitants of Terra del Fuego, white? While we may uot know the particular reasons that have caused them to retain a dark skin, we do know that while there may be coloured people at the north, there is no native race of white people within the tropics, saving the Albino negroes—a fact well worthy of consideration. But the reasons may be that the Indians had not long inhabited this country before its discovery by Columbus, and, also, it may be the race that were in possession came from the south, and, as it has been observed, it takes much longer for a coloured skin to turn white in our northern latitudes, than it does for the white to turn black in the torrid zone—the power of the sun having a greater influence upon the system, than its comparative want of influence here.

It is said that a colony from Portugal, who went to reside in Africa, without amalgamating with the natives, became black after a few generations; and with regard to our coloured population at the north, though it might take many generations before they become perfectly white, yet we doubt if many are born with that extremely dark hue that is the characteristic of those born under the equator. We know that vegetables very soon change from white to green if placed in the sun, but the green never changes to white when put in the shade. A number of individual cases of gradual change of colour in the healthy African, in northern latitudes, are on record. One case of partial change occurred in my native town, in a young man by the name of Croyden Chesley.

I cannot, therefore, but think that it is the influence of the sun's rays upon the surface of our bodies, when they are exposed to it, or the absence of these rays, that produces the varieties of colour; and owing to circumstances and favourable causes, the skin is made to change from one colour to another. It is noticeable, that those white varieties, among others that are black, when the race is admitted to be the same, occur in northern latitudes, or in the neighbourhood of forests or mountainous regions, where the heat may not be supposed to be so great as it is around the desert of Sahara in Africa.

There is another answer to the question, and it may be conclusive. We of the white race, in the northern latitudes, have from necessity been clothed and housed, our bodies have been for the most part shielded from the sun, and we have comparatively grown up in the shade. "My child, you must not go out in the sun, you will get tanned," are the words of the mother, and such has been the case among all civilized nations. Whereas, the Indians, during the heats of summer, wander about comparatively unclothed, and expose themselves to the influences of the clime. What effect such a course of action would have, may in some measure be judged by the casual exposure of any one, during the heat of summer. As has been remarked, the skin alters its hue, and the man is tanned. May we not reason from such facts, that if man was constantly exposed the nature of his skin would be changed; that it would accommodate itself in a degree to the change of circumstances.

Even the broad nostril of the negro may have its use in the giving free egress to the vapour and heat generated in the lungs; and the contracted one of the white man, in protecting the lungs from exposure to the different temperatures that exist without and within. So that when the negress told Mungo Park she could not conceive what woman would have such a thin-lipped, pale-faced, *peaked-nosed* man as he, her ideas rested upon an internal sense of propriety, rather than on mere fancy.

I hope your readers will here pardon me in digressing a few moments, while speaking of the hair, which distinguishes the African from the rest of his species, though it may not be necessary to allude to it, as for the most part it is well known that the hair on our lower animals is usually coarser on those of the south than on those of the north, and the same causes are at work that makes that of man to be the same; even as the vegetable is ranker at the south than at the north. But, whatever may be the cause, who is there that has looked upon the flowing wig of bygone days, does not see our fathers were not so prejudiced against this kind of head-dress, which is a faithful imitation of what a negro's would be if he should suffer his hair to grow long. Besides, is there any lady who does not look upon her own frizzets with satisfaction, to say nothing of the complaisant countenances of our young men who have just begun to sport a pair of whiskers, and who seem to think they ought to receive greater consideration on their account; and yet, if they will reflect, they must conclude there is very little difference between having a curly head, and a curly chin; and if man originated between the tropics, as is most universally concluded he did, we may suppose we have not been changed from one colour to the other a sufficient length of time to get rid of all our fathers' characteristics.—*Boston Medical and Surgical Journal.*

CRITICAL OBSERVATIONS ON THE PHENOMENA OF RESPIRATION.

By M. Gay-Lussac.

Two principal theories have been proposed relative to the chemical phenomena of respiration.

In the one, long adopted by chemists and physiologists, the formation of carbonic acid and water, as well as the production of nitrogen, take place in the lungs themselves, on the contact of the oxygen of the air with the capillary blood-vessels.

In the other theory, oxygen does not act immediately in the lungs on the blood, it is simply absorbed; and the chemical phenomena to which it may give rise take place out of the lungs in the circulation, and it is only at the return of the blood to the lungs that it pours in the products of oxidation.

This latter theory, which was long foreseen, confirmed, and shaken in turns, by some opposed facts, has finally become current in science, since the last work of M. Magnus on Respiration,* a delicate and difficult work, the object of which was, by proving the presence of carbonic acid, oxygen, and nitrogen in the blood, to give the new theory of respiration a solid basis, which it had previously wanted. Judging from the assent of some eminent chemists, and from the silence of criticism, the investigations of M. Magnus seemed to have fixed the opinions concerning the chemical phenomena of respiration; and it is not without diffidence that, impressed by the doubts which have arisen in my mind, I raise a discussion which, however, has no motive but the interest of truth.

M. Magnus first sought to prove that human venous blood contains carbonic acid. For this purpose, he passed through blood a current of hydrogen which, after having been dried, yielded the carbonic acid with which it was charged to potassa in Liebig's bulbous apparatus. Experi-

* *Annales de Chimie et de Physique*, t. lxv. p. 169.

ments, each of which lasted six hours, gave him the following results:—

Human venous blood.	Carbonic acid.	Or per cent. of blood.	Carbonic acid.
cc.	*cc.*	*cc.*	*cc.*
66·8	16·6	100	24·8
59·8	12·8	100	21·4
62·6	22·2	100	35·2

After twenty-four hours, at the end of which time the blood still had no odour:

Human venous blood.	Carbonic acid.	Or per cent. of blood.	Carbonic acid.
cc.	*cc.*	*cc.*	*cc.*
62·8	24·9	100	37·2
59·8	23·9	100	40·0
62·6	34·0	100	54·0

By replacing the hydrogen by air, oxygen, or nitrogen, the results remained the same.

I will not stop to discuss these results, which prove besides that the blood contains much carbonic acid; I will only remark that they are not complete, for it would be necessary to submit to the same trials arterial blood, which also contains carbonic acid. It would also be necessary to determine the relative quantities of oxygen and nitrogen contained in each kind of blood.

But this important deficiency having been made up in another series of experiments of M. Magnus, by subjecting blood to the vacuum produced by the pneumatic machine, we will particularly direct our attention to the various results which he obtained in these new circumstances. We must take them as published, and refer for the details of experiment to his memoir. The following table contains all these results; they are only arranged in a different order. We have collected together the results which relate to arterial blood, and, separately from these, the results obtained with venous blood. Finally, that all the experiments may inspire the same confidence, and in order to diminish the differences which might exist between one experiment and another, we have taken the average of the results for each kind of blood, without regarding the different nature of the animals by which it was furnished.

Arterial Blood.

Source of the Blood.	Volume of blood.	Carbonic acid.	Oxygen.	Nitrogen.
	cc.	*cc.*	*cc.*	*cc.*
Arterial blood of a horse, A	125	5·4	1·9	2·5
Natural blood of a very old but healthy horse, B	130	10·7	4·1	1·5
The same blood, B	122	7·0	2·2	1·0
Arterial blood of a cow, C	123	9·4	3·5	1·6
The same blood, C	108	7·0	3·0	2·6
	608	39·5	14·7	9·2
Or, by reducing the volume of blood to 100	100	6·4967	2·4178	1·5131

Venous Blood.

Source of the Blood.	Volume of blood.	Carbonic acid	Oxygen.	Nitrogen.
	cc.	*cc.*	*cc.*	*cc.*
Venous blood of the same horse, A . .	205	8·8	2·3	1·1
The same venous blood, A	195	10·0	2·5	1·7
Venous blood of the same old horse, B, collected three days after	170	12·4	2·5	4·0
Venous blood of the same cow, C, collected four days after	153	10·2	1·8	1·3
The same venous blood	140	6·1	1·0	0·6
	863	47·5	10·1	8·7
Or, by reducing to 100	100	5·5041	1·1703	1·0081

Before interpreting the results contained in this table, it is necessary to explain, more clearly than we have done, in what the new theory consists.

It admits that, in the act of respiration, the oxygen of the air is absorbed by the arterial blood in the lungs; that it is afterwards carried into the torrent of the circulation; that, in the passage, and by the *secreting* action of the capillarics, a certain quantity is combined, partly with carbon, to form carbonic acid, which remains in solution in the blood; and partly with hydrogen to form water. The blood, thus charged with carbonic acid, and converted into venous blood, arrives in the lungs, where it abandons its carbonic acid—again requires oxygen, and, again becoming arterial blood, commences a new revolution.

Thus, M. Magnus should principally prove:—

1. That venous blood should contain carbonic acid; and in the case where the arterial blood also contains it, in greater quantity than the latter.

2. That the difference of the quantities of carbonic acid in each blood should satisfy the exigencies of respiration.

3. That the quantity of oxygen absorbed in the lungs by the arterial blood, and afterwards abandoned in its passage through the circulation, should likewise satisfy both the production of carbonic acid and that of the water, which always accompanies it in the act of respiration.

4. That venous blood should contain nitrogen, and more than arterial blood, in the case where the latter contains it also.

Let us see, then, whether these different conditions are satisfied by the experiments of M. Magnus.

The results contained in the last table evidently prove that arterial and venous blood contain in solution carbonic acid, oxygen, and nitrogen. This is a fact acquired to science, if the experiments of M. Magnus are indisputable. But in examining the relative quantities of gas in each kind of blood, very manifest contradictions were soon discovered. Thus, whilst 100 parts in volume of arterial blood produced 6·4967 of carbonic acid, venous blood furnished only 5·5041. And yet the relative quantities of acid, in each blood, should evidently be in the contrary direction. Consequently, if there do not exist some unperceived error in the results of M. Magnus, if I myself have not made some mistake, this new theory of respiration should vanish with the essential basis of which it is thus deprived; for this theory requires that the venous blood should contain more carbonic acid than arterial blood, and the very experiments of M. Magnus depose to the contrary; arterial blood contains 18 per cent. more carbonic acid than venous blood does.

It is true that, by his mode of experimenting, which consisted, as we have said, in submitting the blood to the action of a vacuum, to disengage from it the gas which it contains, M. Magnus did not, perhaps, extract from the blood one-tenth part of the carbonic acid which it may contain, since, by passing hydrogen into venous blood, he obtained as much as 54 per cent. of carbonic acid. But it should not the less be admitted that the fractions of carbonic acid obtained by M. Magnus should be proportional to the absolute quantities contained in each kind of blood; and that if, *ipso facto*, they were not so, no other conclusion could be arrived at, than that the experiments of M. Magnus are quite incomplete, and that they cannot lend any support to the new theory of respiration.

The same difficulty as for carbonic acid presents itself with regard to nitrogen; arterial blood should contain less than venous blood, and, according to the table of results of M. Magnus, it contains one-half more. It is well known that nitrogen is produced in the act of respiration, and M. Despretz has proved even that its volume amounts to about one-fourth of that of the carbonic acid. Facts, then, would here be formally opposed to theory.

The proportions of oxygen alone proceed in a favourable direction for each kind of blood; for 100 parts of arterial blood gave 2·4178 of it, and venous blood only 1·1703, or above one-half less. But in presence of the negative results which we have noticed as regards carbonic acid and nitrogen, it may be asked, what value should rest on that concerning oxygen? We will accept it, however, and will examine the consequences.

It is at once evident, that since carbonic acid is produced during the act of respiration, at the expense of the oxygen absorbed by the blood, there should be a certain relation between the volumes of these two elastic fluids. If, for example, we knew only the relative volume of carbonic acid expired in a given time, we should know that the corresponding volume of oxygen absorbed should be at least equal to it; and this condition being thus established, it would be easy to ascertain if it were satisfied by the direct results of experiment. Unfortunately, those obtained by M. Magnus, on the quantity of carbonic acid contained in arterial and venous blood, weaken each other, and have absolutely no value.

In the absence of positive data, which should be afforded by the work under discussion, we will draw from other sources those which we require, and we cannot do better than take the data adopted by M. Magnus. These data are:—

1st. That, according to Sir H. Davy, a man expires in one minute 13 cubic inches of carbonic acid.

2nd. That each pulsation of the heart furnishes one ounce of blood; and that, supposing there are 75 pulsations per minute, 75 ounces of blood, or 115·7 cubic inches, pass in the same space of time.

Consequently, since 115·7 cubic inches of blood contain 13 of carbonic acid, 100 of blood should contain 11·23, a quantity which blood might very well furnish; for M. Magnus admits, according to his experiments, that it contains more than 20 per cent.

Now, supposing that venous blood abandons 11·23 per cent. of its volume of carbonic acid, it is evident that, in order to produce it, arterial blood should contain at least an equal volume of oxygen, or 11·23.

Moreover, as in the act of respiration, of four parts of oxygen absorbed three are converted into carbonic acid and one into water, the blood should take in the lungs not only 11·23 of oxygen, but indeed $11{\cdot}23 + \frac{11{\cdot}23}{3} = 14{\cdot}97$, a quantity which is sixteen times more considerable than that (0·926) which pure water could take in the same circumstances, that is to say, in presence of atmospheric air, and which would amount to $14{\cdot}97 + \frac{100}{21} = 71.3$ if the blood were in contact, instead of air, with an atmosphere of oxygen.*

* I admit, from old observations which are common to myself and my illustrious friend, M. de Humboldt, that water which has been in contact

Finally, if it be admitted, with M. Magnus, that venous blood, on its arrival in the lungs, retains nearly half of the oxygen previously contained in arterial blood, the total quantity which the latter should contain on leaving the lungs would be —1st, 14·97 destined for forming carbonic acid and water; 2nd, $14\frac{97}{2}$ which remain in the venous blood, that is to say, in all, 22·45, which would suppose that, in contact with an atmosphere of oxygen, 100 of arterial blood might take $22{\cdot}45 \times \frac{100}{21} = 106{\cdot}9$ of gas, or more than its volume. Assuredly, such a solubility of oxygen in blood, twenty-four times greater than in water, is not impossible; but still it should be proved, or at least rendered probable. I agree, if it be wished, that the data which I have adopted after M. Magnus have not, perhaps, all the accuracy desirable; and that large concessions may be made with regard to them; but, even by altering them greatly, the objections derived from so extraordinary a solubility of oxygen in blood would, nevertheless, still have great force.

Here it is very necessary to be understood with respect to the idea which should be formed of the union of oxygen with the blood. Does it take place by virtue of the affinity which produces combinations? Is it simply by virtue of that which presides over solutions?

I have reasoned on the hypothesis of a simple solution. M. Magnus has also adopted it, and he could not do otherwise. This is evident as regards the carbonic acid and nitrogen; for, as these two gases must be disengaged from the blood in contact with air in the lungs, they must be retained by only a very feeble force, that which produces solutions.

As to the oxygen which, after having been absorbed by the blood, is disengaged from it only under the form of carbonic acid, it seems that M. Magnus should have been able to admit that it combines immediately and intimately with the blood; he would thus have eluded the difficulty we have mentioned of so great a solubility as that to which we have been led to satisfy the exigencies of theory. But this is why M. Magnus has not been able to have recourse to affinity for fixing the oxygen in the blood. It should, then, have been asked of him why oxygen, fixed in the blood by virtue of a chemical affinity, should not immediately have produced its final effect? Why its action should be divided into two, one in the lungs, and the other out of the lungs, in the capillarics, in order finally to produce carbonic acid and water? M. Magnus has comprehended a difficulty which would have had the result of falling into the old theory, and he could avoid it only by admitting that oxygen was absorbed by the blood only by a solvent power.

After this explanation, it will be well understood that all the gases which intervene in the phenomena of respiration, whether they be absorbed by the blood or disengaged from it, do but obey a simple force of solution, according to the laws established by Dalton.

With the view of elucidating the question under discussion, we will make a new application, with data partially different from those of which we have made use.

According to recent experiments of M. Bourgery, an adult man, respiring freely, introduces at each respiration a *demi-litro* (1 pint English) of air into the lungs. He performs 15 such inspirations in one minute, and, during the same space of time, the heart makes 60 pulsations. Let us still suppose as before, that in one minute the heart throws 75 ounces of blood into the lungs, or, which comes to the same thing, 2 lit. ·3: finally, let us admit, with several observers, among whom I reckon myself, that the air expired from the lungs contains on the average, 4 per cent. of its volume of carbonic acid, we shall be led to the conclusion that, since the volume of air introduced into the lungs in one minute is about 7 lit. ·5 (15 pints), whilst that of the blood which circulates through them in the same time is about 2 lit. ·3, or 3·26 times less. It is necessary, according to Dalton's law, and admitting that venous blood dissolves its own volume of carbonic acid, that, in order that it may give to the air in the lungs 4-100ths of its volume of carbonic acid, or in all 13, representing 13 of oxygen, it should contain $(1+3{\cdot}26) \times 4 = 17{\cdot}0$ per cent. of its own volume. This is the minimum of carbonic acid which venous blood should contain; and as arterial blood also contains it, this minimum would be the difference on the quantities of carbonic acid contained in each blood.

With regard to the oxygen necessary for forming the 13 per cent. of its volume of carbonic acid, which venous blood abandons to the air in the lungs, it is quite evident that arterial blood should absorb a similar volume for the production of carbonic acid, and even one-third more to furnish that of water. Now, the experiments of M. Magnus are far from satisfying these conditions.

M. Magnus seems to think that his theory is powerfully supported by the existence of carbonic acid in the blood. He would be right if venous blood contained decidedly more carbonic acid than arterial blood; but as this result is far from proved, the presence of carbonic acid in the two bloods proves nothing more than a solubility for this gas, of which all theorists may avail themselves.

M. Magnus explains, to a great extent at least, the change of colour of venous blood by the loss of carbonic acid which it suffers in the lungs. Two reasons prevent us from partaking in this opinion—the first, that it is not demonstrated that venous blood is freed from carbonic acid in the lungs; the second, that supposing that it were, the quantity of carbonic acid which it would retain, according to M. Magnus, should be so great in proportion to that which it gives up, that so remarkable a change of colour could not be explained by so small a loss.

I do not wish to carry this discussion further. Incomplete as it is, it appears to me demonstrated that the theory of respiration maintained by M. Magnus rests on no solid basis; and that a new examination of the chemical phenomena of respiration has become necessary. I own that I should not have dared to undertake it alone; but I have the satisfaction of announcing that my illustrious *confrère*, M. Magendie, is kind enough to join me. From our united efforts, we hope at least, may arise some results contributing to a more perfect knowledge of the important function of respiration.

M. Magendie said that he had very recently analysed, comparatively, arterial and venous bloods, with relation to the carbonic acid which they contain. He found, in acting by displacement, 0 gr. ·066 of it in 100 grammes of arterial blood, and 0 gr. ·078 in a similar quantity of venous blood. This result comes in support of what M. Gay Lussac had said concerning the disagreement which exists between the experiments and the theory of M. Magnus; for, if this cypher contradicts the fact advanced by that chemist as to the greater proportion of carbonic acid in arterial blood than in venous blood, it would furnish a proof in favour of his theory.—*Chemist.*

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with atmospheric air contains $\frac{1}{3\frac{1}{3}}$ of its volume of air composed of $\frac{1}{3} = 0{\cdot}926$ of oxygen and $\frac{2}{3}$ of nitrogen; whence it is concluded, that 100 of water in contact with air would dissolve 4·41 of it, and with nitrogen 2·34.

SELECTIONS FROM GERMAN JOURNALS.

By Sigismund Sutro, M.D.

On Ioduret of Ammonium (N H·⁴ I) by *Dr. Böcker.*

Something appears to be deficient in the scrofulous constitution. In the urine, the non-azotised compounds, benzoic or oxalic acid predominate; thus, want of nitrogen is apparent. As the azotised animal diet is supplanted by potatoes and vegetables, the scrofulous disease is spread about in proportion. This disease was little, if at all, known to the ancients. The milk of the mother is azotised enough for infancy, but the child, when it masticates, requires meat, although in higher ranks meat is withheld out of prejudice, in lower out of want. The antipathy of scrofulous subjects to animal food is explained by their organism approaching nearer the vegetable state, as showed by the scrofulous pseudo-organisations so similar to vegetable productions. Further, the blood of the scrofulous contains fewer globules; too many of them are dissolved in the plasma, from want of the necessary salts, chiefly, introduced into the body by animal diet (phosphates). In the third place, in certain cases of scrofula, the body does not possess the necessary quantity of carbon, as is shown by the less carbonised bile, and by the excessively reddened venous blood. All substances containing amylum, potatoes, &c., have less carbon, in proportion, than fat and animal albumen. Now, the question arises, how does this newly-recommended anti-scrofulous remedy, ioduret of ammonium, supply the wanting substances? According to H. Schultz *(System der Circulation)*, the blood vesicles are compressed and condensed by iodine. After putting iodine into the mouth of a frog, its blood-vesicles were found quite condensed. According to him, the blood vesicles arise from the globules of albumine, and become plasma after having absorbed oxygen. Albumen can be formed out of fat, by means of oxygen and nitrogen. To prevent the plasma of the blood, formed from the blood-vesicles being of too low an organization, the blood-vesicles must be strengthened and condensed, and this is done by iodine. The sanatory process of iodine is not positive, but negative, *id. est;* it does not supplant the missing constituents of the organism, but removes the obstacles to a higher organisation. The sanatory process becomes positive only when we supply the blood at the same time with azote, carbon, and the missing salts. Food cannot make up this deficiency if the apparatus of chymification and chylification be deeply affected, although in ammonia we possess an azotic combination, fit for the nourishment of the animal and vegetable kingdom. While, however, ammonia alone might even be injurious, when there is a want of azote, *ioduret of ammonium* answers all indications. But where there is also a want of carbon, a soluble salt, which contains azote, carbon, and iodine, ought to be given in doses which might keep the mean between remedy and food. But, under all circumstances, proper food, cleanliness, improvement of temperature, are necessary conditions for the cure of scrofula. The following notice occurs in the *Pharmaceutical Central Journal:*"—"Dr. Von Breslau, of Munich, has used, externally, for some time, for the dissolution of glandular swellings, a powder consisting of one part of ioduret of potassium, and eight parts of sal ammoniac. The efficacy of this remedy is based on the formation of ioduret of ammonium. A. Vogel, by experiments, found that the two salts do not decompose each other in a perfectly dry atmosphere, but in a moist temperature there is formed ioduret of ammonium, which gives off gradually a part of its iodine (and hence the ammoniacal smell and colouring of the mass). No oxygen is absorbed, and the water is gradually decomposed." Whether ioduret of potassium enter the organism and effects the cure, or whether the other substances aid its efficacy, is another consideration. The first patient to whom the author administered the above remedy, was a boy of thirteen years of age, who had been affected from his earliest infancy with different forms of scrofula, and had been treated unsuccessfully with the whole host of anti-scrofulous remedies. The author had treated him since 1841, for various inflammations of the eyes, erysipelas of the head, and general scrofula, with baths, and a carefully regulated diet; he also gave the ioduret of potassium (internally and externally), ioduret of iron (till salivation began to show itself), the *juglans regia* (internally and in baths), but all without avail. On examination, the urine was found to contain benzoic acid. At last, on the 5th September, 1843, the author resolved to administer ioduret of ammonium (R. iod. ammon., ℈ijss. Solve in aq. destil., ℥ij.; syr. simpl. ℥j. To take a teaspoonful four times a day). After six days the patient appeared to be more cheerful; his unnatural appetite decreased, whilst he enjoyed better the meals he took; the complexion became more healthy, and the exanthematous eruption began to dry off. The author rose to three grains in each dose, four times a day, and

under this treatment the abdomen became thinner, and the glandular swellings of the neck diminished. The same dose was then given five times a day. After three weeks from the commencement of the treatment, all symptoms of the complaint were materially improved; a pause of three days was then made (because the apothecary did not possess the remedy by him); the remedy was then administered again, the doses being raised to six in the day, and subsequently decreased again to three. With this treament, the boy was so completely recovered on the 18th of November, that he could scarcely be recognised, and nothing morbid could be perceived about him. The author mentions that the general treatment was the same during this period as before, and that no disagreeable effect was produced by the remedy. After this, he administered the ioduret of ammonium to a relation of his, fifteen years of age, who was afflicted with a similar disorder, and who had been for a long time under the hands of several eminent medical men, and also under his own care, without deriving any benefit. After she had taken the ioduret of ammonium, for six weeks only, nothing remained but the scars from the suppuration of the glands in the neck. She still continues the use of the remedy, and the author promises to furnish the ultimate results. In four other cases this medicine showed good effects, but the author defers giving their history until the cure is complete. A girl of five years of age had suffered from scrofula, precisely in the same way as the first-mentioned boy, but she was, besides, affected with *ozaena scrophulosa;* her treatment consisted, in the first place, of the ioduret of potassium, and the *juglans regia;* she then got the itch, and after it had lasted for a month, she was cured of it within five days by an ointment consisting of sulphur, chloride of calcium, and lard. The author then administered, during eight days, one grain of ioduret of ammonium four times a-day; then, during eight days, two grains for a dose; and at last, during four days, two grains and a half. After about six weeks the child was perfectly cured. It is to be remarked, that the girl's hair was light-coloured, the boy's dark-brown. In conclusion, the author observes, that he never administered the ioduret of ammonium in a stronger dose than four grains, but it might perhaps be given as high as eight grains. He considers that its efficacy is decidedly different from that of the ioduret of potassium, and that it is also to be preferred to the latter on account of its easy solubility, as well as its agreeable taste (somewhat metallic and sweetish). It must be kept in dark-coloured bottles, or in stone jars. The powder is readily decomposed.—*Schmidt's Jahrbücher der gesammten Medicin.*

VARIATIONS OF THE BOILING POINT OF WATER, ACCORDING TO THE NATURE OF THE VESSELS.—M. F. Marcet has made a series of careful experiments upon the variability of the boiling point of water, according to the different nature of the vessels in which the ebullition took place. The following are the results of his researches on this point:—1, the boiling point of water in glass vessels is at 100°,3 and 102° (cent.) according to different circumstances, and especially according to the varicty of the glass. In these cases, the temperaturo of the vapour of the water is constantly the same, and some hundredths of a degree lower than when the water boils in metallic vessels. 2, Whatever may be the nature of the vessel in which the ebullition is performed the temperature of the aqueous vapour is always inferior to that of the water which gives rise to it. The mean of this difference, in glass vessels, is about 1°·06, while in metallic vessels, it is but as 0°·15 to 0°·20. There is but one exception to this rule, and that is where the interior of the vessel in which boiling is accomplished, whether it be of glass or of metal, is covered with a thin coating of sulphur, or gum-lac, or any other substance which exercises a repulsive action on the water; the boiling water and the vapour are then of the same temperature. 3, Contrary to the opinion generally admitted, the boiling point under a high pressure is not lowest in metallic vessels, but in glass vessels, when the latter are lined interiorly with a layer of the above-mentioned substances. 4, In glass vessels, the internal surface of which is perfectly smooth, and devoid of all foreign matter, we may carry the temperature of water or of alcohol to several degrees above the boiling point, before ebullition is induced; we may thus bring the temperature of water up to 105° before ebullition takes place. If the experiment does not succeed, it is owing to the presence of foreign matters adhering to the internal surface of the glass. We may insure success by making choice of a new globe, and heating therein sulphuric acid, until it reaches X 150°, subsequently washing it out with perfectly pure water.

ELECTRICITY FROM CONTACT BETWEEN METALS AND LIQUIDS.—M. Buff has confirmed, by new and direct researches, the fact, already well known, that metals produce electricity by contact with liquids. The reality of this phenomenon, which is of such great influence in hydro-electric experiments, has been, and still is, stoutly denied by a great number of *savants*, as well as electricity of contact in general. It is from refusing to admit this latter power, that such extraordinary views have been entertained upon hydro-electric phenomena, which may be readily explained through this kind of action. M. Buff observes that the production of electricity by contact, in these circumstances, does not depend alone on the electro-chemical opposition between the metal and the liquid, but that, as liquids are in general compound bodies, it is ordinarily one of the elements which on its side determines the electrical opposition of the metal,—an opinion which is in perfect accord with the electro-chemical theory.

THE HEAT DISENGAGED BY COMBUSTION IS DUE TO AN ELECTRICAL DISCHARGE.—M. Joule has endeavoured to determine by hydro-electrical experiments the relative affinity of different bodies for oxygen, such as potassium, hydrogen, zinc, iron, &c., and, on the other hand, the varying relative intensity of the electric current necessary to overcome all these affinities; lastly, he has, from these facts, sought to establish that the disengagement of heat in combustion is owing to the discharge of opposite forces of electricity. Although this opinion may be admitted by the electro-chemical theory, as representing the most probable cause of the disengagement of heat during combustion, the experiments of M. Joule, and the proofs which he deduces, are not sufficiently decisive to set this question at rest.

CATALYTIC FORCE. — That mysterious action which we attribute to a force of a particular nature, but probably allied to electricity, and which we call catalytic force, has been the subject of a series of experiments, with the view of finding an explanation which would supersede the supposition of such a power. M. Mercer has sought to demonstrate that the cause of these actions resides in a chemical affinity too feeble for action, but which permits one body for which some other has an attraction, to separate itself from the combination which contained it, and to become free. It appears that M. Mercer has not imagined that a force which does not suffice to retain the body free must necessarily be insufficient to destroy the combination of this body with another. When oxalic acid is dissolved in nitric acid, these two acids do not materially decompose one another, or at least they do so to a very insignificant extent, because the affinity of the oxalic acid for oxygen is not stronger than that of nitrogen for oxygen; but if we add a very small quantity of proto-chloride of manganese, the oxalic acid is very rapidly converted into carbonic acid, and the nitric acid into nitric oxide, because the affinity of the manganese for oxygen comes to the assistance of the oxalic acid, and surmounts the affinity of the nitric oxide for oxygen, although the manganese itself appropriates no portion of this oxygen. This fact is his principal argument; still the sulphate and the nitrate of manganese do not produce the same action, whilst sal ammoniac, sea-salt, and hydrochloric acid, give rise to the same phenomenon as the proto-chloride of manganese, for reasons readily explainable, and which have no connection with the class of phenomena dependent on what is termed catalytic force. M. Schweigger has endeavoured to prove, in a short memoir, that the catalytic force is nothing else but electricity, and that platina is a hydro-electric collector. He has cited some experiments in support of his views. In reality, they explain nothing; or we must attribute to platina several properties belonging to other bodies which equally give rise to catalytic actions.

THERMO-CHEMICAL EXPERIMENTS.—M. Hess gives the result of some researches on the disengagement of heat produced by the oxidation of zinc (in the form of the common oxide), by the combination of the latter with acids, and by that of the sulphate with one atom of water, and with seven atoms of water, as also on the absorption of heat which results from the solution of Zn . S + 7 H in water. The development of heat engendered by the formation of sulphate of zinc is composed of simple disengagements of heat, as follows:—

Zn + O	5291
S + 3 O	6391
Zn + S	2982,1
Zn S + H . . .	596,4
Zn S + H + 6 H .	805,8
	16111,3

When we dissolve in water Zn S + 7 H, there is an absorption of heat of 254,4. The disengagement of heat produced by the solution of zinc in sulphuric acid, confirms these relations, as much as experiments of this nature will admit of. By comparing the different quantities of heat set at liberty on dissolving one atom of zinc in sulphuric acid, in nitric acid, and in hydrochloric acid, he found the following relations:—S = 1610, N = 1472, and H Cl = 1275,2.

NEW METHOD OF PREPARING OXYGEN.—M. Balmain prepares oxygen by heating in a retort a mixture of three parts of bichromate of potash with four parts of concentrated sulphuric acid. This mixture furnishes, at a gentle heat, a great abundance of pure oxygen gas, which amounts to but a third of the expense of the same quantity of oxygen prepared by means of the chlorate of potash. One atom of KCr^2 produces three atoms of free oxygen, and leaves a residue composed of KS + Cr S^3, with which a new quantity of bichromate may be readily prepared.

BICHLORIDE OF HYDROGEN.—M. Millon states to have found a combination of hydrogen and of chlorine which contains double the quantity of chlorine that exists in hydrochloric acid. If, to hydrochloric acid, artificially cooled by means of a mixture of ice and salt, we add a small quantity of peroxide of lead, a precipitate of chloride of lead is thrown down, without any disengagement of chlorine; but we obtain a deep yellow liquid, which disengages chlorine during several days on exposure to the ordinary temperature of the air. To prove that this combination is formed of $H Cl^2$, he quotes that mercury, by its reaction upon it, produces chloride of mercury and hydrochloric acid. Zinc, added in small pieces, dissolves also without any disengagement of gas. These proofs are not very conclusive, for the same thing would take place with cold liquid hydrochloric acid in which chlorine gas had been condensed. But, on the other hand, as there exist corresponding combinations with brome and iodine, it is very probable that there also exists one with chlorine, and that it may be produced in this manner. The most easy way of preparing it would be to pass a stream of chlorine through very cold concentrated hydrochloric acid, or else to add liquid chlorine till saturation; or, again, one might endeavour to reduce, below the temperature of 0 deg. cent., a mixture of two volumes of hydrochloric acid and one volume of chlorine, and see if any condensation takes place.

ANALYSIS OF AIR CONTAINED IN CLOSED SPACES.—M. Leblanc has analysed, under the direction of M. Dumas, air contained in closed spaces, and in rooms in which a number of persons were congregated, and has communicated the result of twenty analyses of different places. The details are to be found in his memoir; I shall here instance merely the principal points. He has found that the air of the green-houses in the *Jardin des Plantes* is devoid of carbonic acid, or possesses merely traces of it, whilst it contains 23 per cent. of oxygen. He has found, moreover,

that in places in which a number of persons are congregated together, the quantity of carbonic acid in the air is greater by 4-1000ths than the normal quantity; that the proportion is variable, but that it rarely attains 1 per cent.; the quantity of oxygen is usually less in a similar proportion. He exposed a dog to a mixture of air and pure carbonic acid gas, and found that it could support, with a degree of suffering, 30 per cent., by volume, of carbonic acid in the atmosphere, and afterwards regain its original health. Man could support 6 per cent. of carbonic acid in the air, provided it were pure; but when it has been produced by the vapour of charcoal, a much smaller quantity suffices to bring about suffocation. M. Leblanc attributes this to the presence of carbonic oxide gas, the action of which is deleterious, even when the air contains but half per cent. This idea, however, is erroneous. The volatile body, which causes asphyxia, in what is commonly called the vapour of charcoal, is, indeed, unknown; but, contrary to carbonic oxide gas, it is an odorous body; it is a product of the dry distillation of incompletely carbonised wood. It is very probable that, in those places where large quantities of wood are reduced to charcoal by being burnt slowly in stoves, and where the product of their combustion is spread through the chamber, a certain quantity of carbonic oxide gas may be formed; still there is no danger of being suffocated by the vapour of the charcoal, provided we take the precaution of applying the nose to the ascending current of air, so as to ascertain whether it be inodorous, and to open the windows should it be otherwise; they should be firmly closed only when the ascending current is entirely free from odour. We learn from an article in the "Danish Gazette," that M. Levy, a pupil of M. Dumas, has made in that country some experiments on the composition of the air, and that he has found it to be richer in oxygen just above the sea, and in particular near the surface of the water, than in parts at a distance from the ocean. This fact, perhaps, needs further confirmation.

Caoutchouc impermeable to Gas.—M. Chevreul has shewn by experiments that, although caoutchouc of a certain thickness may be regarded as impermeable to gases, this impermeability is not absolute, and that, when different gases are placed on each side, they readily pass through. We may prevent this inconvenience almost entirely by smearing the external surface of the tube, &c., with linseed oil, or, what is still better, by steeping it for a few hours in boiling linseed oil. M. Peyron also bears evidence to the same facts.

Camphine.—Camphine is obtained by submitting to renewed distillation the product of the distillation of the inspissated oil, which has passed over at a temperature below 180 deg. (cent.), taking care to leave a portion in the retort, which shall contain a little camphor. The new product is then to be agitated with a ley of concentrated potass, which removes the greater part of the iodine; it is then to be distilled twice over potassa cum calce, and lastly over potassium. A sign of its purity is that the potassium becomes dissolved in it without losing its metallic lustre, and that chlorine produces neither a rose nor a brown colour, a test which will discover the least trace of iodine. If it is not perfectly pure, it is to be distilled anew over potassium. Camphine is a colourless oil, possessed of great fluidity, and an agreeable odour, somewhat similar to that of nutmeg and turpentine combined. The specific gravity is 0·827, at 25 deg. (cent.); it boils between 165 and 170 deg. It distils readily, and without alteration, and burns with a bright, fuliginous flame. It is insoluble in water and in dilute alcohol, but is dissolved in concentrated alcohol, ether, essence of turpentine and naphtha. Concentrated potass and dilute acids have no action upon it. Concentrated sulphuric acid, when cold, does not act upon it, but it turns it yellow under the influence of heat. The sulphuric acid of Nordhausen turns it brown, and when heated it disengages sulphurous acid. Common nitric acid scarcely affects it when cold. The fuming nitric acid, on the contrary, acts quickly upon it, and gives it a deep red colour; after a few instants the red colour disappears, the camphine becomes yellow, gives forth an odour similar to canella, and may then be said to enter into combination with the elements of the acid. All these properties require to be carefully studied, and would thus, doubtless, lead to very interesting results. Liquid hydrochloric acid is without action on it. It absorbs hydrochloric acid in very small quantity. Chlorine and brome act energetically upon it, and disengage hydrochloric and hydrobromic acids. Iodine scarcely affects it, but it is dissolved in it, and gives to the solution a deep brown colour. The analysis of camphine furnished (C = 76·42):

	Found.		Atoms.	Calculated.
Carbon	87·29	87·38	18	87·327
Hydrogen ...	12·72	12·85	32	12 673

$=C^9 H^{16}$, or $C^{18} H^{32}$. The formula of camphine consequently differs from that of the essence of turpentine, inasmuch as it contains one atom less of carbon, admitting $C^9 H^{16}$. This oil has exactly the same composition as the oil obtained by M. Deville, by acting on campholic acid by anhydrous phosphoric acid, and which he has called campholine; but the point of ebullition of this latter is 135 deg. instead of 160 to 170 deg. M. Claus also compares it to the menthéne of M. Walther; but M. Walther attributes to the latter the formula $C^{20} H^{36}$, although its centesimal composition is almost the same. Chlorine and brome substitute themselves for the hydrogen in camphine. The new combination loses its fluidity in proportion as it contains more of the halogènic body; its specific gravity is also augmented, but it preserves an aromatic odour similar to essence of turpentine. The reaction becomes more complete under the influence of the solar rays; the combination acquires a consistence similar to that of Venice turpentine, but it remains colourless and neutral.

Manner of distinguishing Antimony from Arsenic in Medico-legal Investigations.—M. Bischoff proposes the employment of the *liqueur de Labarraque (liquid chloride of soda)* to distinguish antimony from arsenic; the arsenic is dissolved completely, whilst the antimony remains insoluble.—M. Meissner proposes the following double reaction:—When the metal has been reduced by means of sulphuretted hydrogen gas, a particle of iodine is to be placed at a small distance from the metallic coating, and is then to be heated, so that the gas is brought into contact with the metal, and is absorbed by it. The arsenic becomes yellow, brilliant, and crystalline, whilst the antimony becomes red and dull. If the two metals are mixed, water will dissolve the combination of arsenic, and will leave the ioduret of antimony insoluble. We may separate the two gases before reducing the metal, by making them pass through a tube provided with several bulbs, containing a solution of caustic potash or ammonia in alcohol. The antimoniuretted hydrogen is absorbed, and communicates to the liquor a deep colour, whilst the arseniuretted hydrogen traverses it without any alteration. The reaction is slower when we employ ammonia, but the antimony is gradually precipitated from either solution, and the liquor becomes colourless. —M. Wakenroder oxydises the metal reduced in the glass tube, by passing through it a current of atmospheric air, and slightly heating it. The arsenious acid is more volatile than the oxide of antimony, and invariably crystallises in very minute but distinct octohedrons; the oxide of antimony, on the contrary, produces confused prismatic crystals. We may free the tube entirely of arsenious acid, whilst the oxide of antimony, combining with an excess of oxygen, gives rise to a white and fixed combination, which becomes attached to the glass, and may be subsequently reduced by heating it in a current of hydrogen; the parts of the tube in which the white matter existed then become black. —M. Fresenius separates the two metals, in the tube in which they had been reduced, in the following manner:—he passes a stream of sulphuretted hydrogen gas into the tube, and heats slightly the metallic coating. The two metals combine with the sulphur; the arsenious sulphuret sublimes at a small distance, and forms a yellow spot; the sulphuret of antimony, on the contrary, remains *in situ*, and becomes black; this done, he passes into the tube hydrochloric acid gas, and heats slightly. The sulphuret of antimony is converted into chloruret of antimony, with disengagement of sulphuretted hydrogen, and is carried away by the gas; it may be collected in water, and submitted to renewed examination. The arsenious sulphuret remains, without undergoing any change, and when the antimony is entirely driven off, it may be dissolved in caustic ammonia, and examined separately.—MM. Danger and Flandin proceed in the following manner, in cases of suspected poisoning by antimony. They boil the organic matter with sulphuric acid, and cool it immediately that it becomes liquid; they then add nitrate of soda, and continue the carbonisation of the mass. They treat the dried mass with a weak solution of tartaric acid, and precipitate the antimony from this solution in the ordinary manner.—*Rapport Annuel sur les Progrès de la Chimie, by J. Berzelius.*

REVIEWS.

Lectures on Agricultural Chemistry and Geology. By James F. W. Johnston, M.A., F.R.SS., L. & E., &c., pp. 911.

Chemical research, even abstractedly considered, must ever reward the labours of the assiduous student; but when the object of his investigation of natural laws and phenomena is the welfare of his species, and the extension of the comforts and conveniences of civilised life, then, indeed, does our favourite science become the benefactor of the human family. Nor, in the whole range of chemico-philosophical studies, is there a more legitimate subject of investigation than the laws which govern the organism and growth of plants, involving, as it does, the means of obtaining for the human race a more abundant supply of food, and at a cheaper and more convenient rate.

There was a time when the practical farmer treated with contempt the proffered assistance of the chemist. The traditionary lore which he inherited from his forefathers was the text-book from which his rules of culture were drawn. The wasteful expenditure of manures, or their misapplication, sanctified by the usage of centuries, troubled not his mind; while innovation, even in the form of improved instruments of agriculture, was looked upon with the most chilling distrust.

That a more liberal and inquiring state of mind now exists, we may thank the patient investigations of modern science, as well as the lucid form in which agricultural chemistry has been introduced to the notice of the farmers, first by our immortal Davy, and latterly by Liebig and Boussingault on the continent, and Johnston in our own country. To the labours of these men especially, is it due, that now, from north to south, through the length and breadth of our land, the aristocratic landlord and the practical farm-tenant, the owner of a thousand acres and the cultivator of a solitary farm, are engaged in a class of studies and experiments, which, twenty years ago, were confined to the laboratories of the higher orders of our chemical philosophers.

The peculiar position, too, of our country has also aroused the energy of our scientific population.

"When a tract of land is thinly peopled, like the newly settled districts of North America, New Holland, or New Zealand, a very defective system of culture will produce food enough not only for the wants of the inhabitants, but for the partial supply of the other countries also. But when the population becomes more dense, the same imperfect or sluggish system will no longer suffice. The land must be better tilled, its special qualities and defects must be studied, and means must gradually be adopted for extracting the maximum produce from every portion susceptible of cultivation.

The British islands are in this latter condition. Agriculture is now of vastly more importance to us as a nation, than it was towards the close even of the last century. In 1780, the island of Great

Britain contained nine millions of inhabitants; it now contains nearly twenty. The land has not increased in quantity, but the consumption of food has probably more than doubled. The necessary importation from abroad has not been augmented in any very great degree; by improved management, therefore, the same area of land has been caused to yield a double produce.

But the population will continue to increase: can we expect that the food raised from the land will continue to increase in the same ratio? This is an important question, to which we can give only an imperfect and somewhat unsatisfactory answer.

The superficial area of Great Britain comprises about fifty-seven millions of acres, of which thirty-four millions are in cultivation, about thirteen millions are incapable of culture, and the remaining ten millions are waste lands, susceptible of improvement. The present population, therefore, is supported by the produce of thirty-four millions of acres, or every thirty-four acres raises food for about twenty people. Suppose the ten millions of acres which are susceptible of improvement be brought into such a state of culture as to maintain an equal proportion—the most favourable supposition—they would raise food for an additional population of about six millions, or would keep Great Britain independent of any large and constant foreign supply, till the number of inhabitants amounted to twenty-six millions. But at the present rate of increase this will take place in about twenty years, so that by 1860, unless some general improvement take place in the agriculture of our country, the demands of the population will have completely overtaken the productive powers of the land.

But though we cannot say how far the fertility of the soil may be increased, or how long it may be able to keep ahead of the growing numbers of the people, we have our past experience, the example of other countries, and the indications of theory, all concurring to persuade us that the limit of its productive powers can neither be predicted nor foreseen.

If we glance at the history of British agriculture during the last half century, from the introduction of the green-crop system, or the alternate husbandry from Flanders, into Norfolk, up to the present time, we find the results of each successive improvement more remarkable than the former. The use of lime, or more general drainage of the soil, the invention of improved ploughs, and other agricultural implements, as well as the introduction of better and more economical modes of using them: the application of bone manure, and more recently of thorough draining and subsoil ploughing, have all tended not only to the raising of crops at less cost, but in far greater abundance, and on spots which our forefathers considered wholly unfit for the growth of corn.

The result of each new improvement, I have said, has seemed more astonishing than the former. For, after a waste piece of land has been brought into an average state of productiveness, we are not prepared for any great improvement upon it by new labours; nor could we readily believe that half a century after such land had been in culture, its produce or its value should at once be doubled by a better draining, a deeper ploughing, or by sprinkling on its surface a small quantity of a saline substance imported from a foreign country."—*Johnston*, page 9.

These are important considerations, and well worthy the attention of all consumers, whether in the higher or lower walks of life. We are especially anxious to impress upon our own profession the necessity of a careful course of reading on agricultural chemistry. It is demanded of them from the position which they hold as members of a learned body, interested in all that concerns the kindred sciences. It is demanded of them, as the conservators of the public health, who ought to know the dangers of famine, or of insufficient supplies of food; who are aware of the value of drainage, not only on the vegetable, but also on the animal constitution. It is, however, especially demanded of the country practitioner, who is likely, in the onward march of science, to be the chemical, as well as the medical adviser of the uneducated and insulated farm-tenant. To such, then, we most cordially commend Johnston's Lectures, which commence:

"With the discussion of those elementary principles which are necessary to a proper understanding of each branch of the subject." * * * "Thus the first part is devoted to the *organic elements*, and parts of plants; the nature and sources of those elements, and to an explanation of the mode in which they become converted into the substance of plants; the second to the *inorganic elements* of plants, comprehending the study of the soils from which these elements are derived, and the general relations of geology to agriculture; the third to the various methods, mechanical and chemical, by which the soil may be improved, and especially to the *nature* of *manures*, by which soils are made more productive and the amount of vegetable produce increased; and the fourth to the *results of vegetation*, to the kind and value of the food produced under different circumstances, and its relation to the growth and feeding of cattle, and to the amount and quality of dairy produce" (see Preface).

To the latter part of this valuable book we especially direct the attention of medical chemists. The changes which take place in cattle under various circumstances, demand especial and searching investigation. Facts have recently come to our knowledge of the most startling and important description: to wit, that the kine kept in the dairies of large towns, deprived of course of natural exercise, air, and food, all present a predisposition to tubercular disease of the lungs; and if not killed for beef would eventually die of pulmonary consumption. How far the milk of such animals may contribute to the dissemination of disease we are not prepared to say, but it is a fact well worthy of the attention of the guardians of public hygiene.

We cannot conclude our notice of these excellent lectures without congratulating Mr. Johnston upon the lucid manner in which the subjects are explained. He has not made the usual mistake of authors, and assumed that his readers know more than they really do. The work is truly elementary, and the beautiful scientific facts with which it abounds will render it popular with all who thirst after knowledge.

PHARMACEUTICAL SOCIETY.

July 11.

Mr. Morson in the Chair.

Mr. Scanlan made some observations *on the presence of lead in water, condensed in lead pipes,* in the course of which he stated that when the subject was introduced at the last meeting of the Society, he mentioned the fact of the presence of an appreciable quantity of lead in distilled water, which had been condensed in leaden pipes, employed in a chemical factory for the purpose of evaporating certain acid and saline solutions. This water, when cold, holds in solution a quantity of oxide of lead, shewn by the transmission of a stream of sulphuretted hydrogen through it; and it carries along with it, as it issues from the waste-pipe, nearly in a boiling state, a considerable quantity of lead, held in mechanical suspension, and but slowly deposited, owing to its state of aggregation. When diffused through the water, just as it issues from the waste-pipe, or when stirred up, after it has been deposited by rest, this salt of lead has the appearance of very minute crystals, of a pearly lustre; but in time these crystals subside, leaving the water perfectly transparent, and the deposited salt can readily be collected in quantity sufficient for examination; when, somewhat to Mr. Scanlan's surprise, seeing the temperature at which it was formed, he found it to be a carbonate; and he also found the water in which this salt had been suspended perfectly neutral to test-paper, and free from other saline matter than lead. Carbonate of lead, then, would appear to be formed at or above the temperature of 212 deg., by the action of the steam alone, as it issues from the boilers upon the interior of the lead pipes, the steam not being simply vapour of water, for it must carry along with it a continuous stream of atmospheric air and carbonic acid, arising from the cold water with which the boilers are being continuously fed, as, from local circumstances, the hot water cannot with ease be employed for that purpose. The water they obtained is unfit for medical purposes, from this contamination, nor is it fitted for nice chemical purposes, from the same cause, although the quantity of carbonate of lead held in solution appears to be exceedingly minute; so much so as to escape detection by any other test than sulphuretted hydrogen, unless the water be previously evaporated. The carbonate of lead does not appear to be more soluble in hot than in cold water, for the water does not deposit any of it on cooling, if filtered from the mechanically suspended carbonate as it issues from the waste-pipe.

Apparatus for the Generation of Sulphuretted Hydrogen.

Mr. Scanlan then introduced to the notice of the Society a very simple and effective apparatus, of little cost, for the purpose of obtaining, at any moment, a continuous and steady stream of sulphuretted hydrogen. It is made on the principle of Doberheim's lamp, and consists of a common cylindrical vessel of brown stone ware, about six inches diameter, and nine deep, in which is placed an inverted funnel of the same material, within which is put a tray of nearly the same diameter, and about an inch deep. This tray must stand up about an inch from the bottom of the outer vessel, and within the funnel, in order to prevent escape of gas from expansion, by change of temperature, when the generator is not in use. To the tail of the funnel must be adapted a piece of thin gas tube, bent once, at a right angle, to the other end of which is soldered a gas-cock, into which may be cemented a glass-tube, for immersion into the liquid to be tested. A washing bottle may be adapted, if necessary, to prevent any sulphate of iron being carried mechanically from the generator into the liquid under examination.

Mr. Scanlan then alluded to *the presence of arsenic in sulphuric acid.* He observed, that having had occasion lately to make a quantity of pure muriatic acid, he took what he then conceived to be oil of vitriol made from sulphur, for the purpose, but which he has since learned is prepared from pyrite. Knowing that neither iron nor lead would be present in the acid, and not suspecting the presence of arsenic, he did not test the muriatic acid for the metallic impurities at first; but, upon examination subsequently, the presence of a very large quantity of arsenic was proved beyond a doubt; in fact, such a quantity as one would be surprised to find in the commonest commercial muriatic acid. He remarked, that he had been long aware of the existence of arsenic to a great extent in the sulphuric acid employed by the Lancashire and other alkali makers in the north of England, and has seen arsenious acid in great quantity sublime in the kilns, which they employ for roasting the pyrites. Mr. Gamble, an extensive alkali maker at St. Helen's, told him, that when erecting a new oil of vitriol chamber, he could not use his own vitriol to make hydrogen for Debruck's patent blowpipe, now in use for autogenous soldering, in consequence of the quantity of arsenic it contained,

and he was obliged to get acid for this purpose from another maker, who used sulphur. From the London acid he has obtained 1·5 grains sulphuret of arsenic (from 2,000 grain measures of the acid), it being in other respects quite pure. This very large quantity arises from the employment of two atoms, S. H., to decompose the salts, as recommended by Dr. Gregory.

On Extract of Hemlock.

By Mr. Scanlan.

The author drew the attention of the Society to the preparation of the green extracts, previously deprived of their albumen. He observed that, several years ago, in conjunction with his late partner, Mr. Hunt, of Dublin, he was in the habit of preparing annually large quantities of belladonna extract, which was cultivated in the ground attached to the factory. At first, there were constant complaints of the extract becoming mouldy, but, ever since the plan of separating the albumen was adopted, this extract, as well as that of henbane, kept without moulding for years. The mode of separating the albumen is this: you let the expressed juice of the plant operated upon stand till the chlorophylle has separated, then decant the clear liquor, and heat it to about 140°, when the albumen coagulates, and is very readily separated by a strainer. The filtered liquor is now evaporated, and the chlorophylle stirred in as the extract thickens. Extracts prepared in this way are much smoother than if the albumen be suffered to remain, and will keep any length of time. The amount of the albumen is so small as compared to the whole extract, that it does not materially affect the strength of the preparation. It would be well if the framers of the Pharmacopœia would direct the chlorophylle also to be separated, as it, as well as the albumen, is inactive. In an accurate experiment Mr. Scanlan made upon the juice of conium, he found the coagulated albumen to be to the extract without the chlorophylle as 1 to 10, that is, a portion of juice freed completely from chlorophylle by filtration, coagulated by heat and filtered again, gave 1 part of albumen and 10 parts of extract; and two experiments from equal quantities of expressed juice, gave:

Extract free from albumen, but containing chlorophylle, 40.

Extract containing both, 47 : 100 :: 40 : 85, 15 per cent.

ROYAL SOCIETY.

A Description of an Extensive Series of the Water Battery, with an Account of some Experiments made in order to test the Relation of Electrical and Chemical Action, which takes place before and after completion of the Voltaic Circuit.

By J. P. Gassiot, Esq., F.R.S., &c.

[Read January 26, 1844.]

In a former paper, printed in the Phil. Trans., 1839, the author described experiments made with powerful voltaic batteries, with a view of determining the possibility of obtaining a spark before completion of circuit. This, which he advisedly called an *anticipated* effect, did not occur. Soon after this Mr. Crosse obtained the spark from a series of 1626 cells of zinc and copper excited with river water. The author, pursuing his researches, constructed a series of 3520 pairs of zinc and copper, each in a separate glass vessel, well covered with lac-varnish, and insulated by being on slips of glass covered with lac. The cells were placed on 44 oaken boards, also covered with lac-varnish, each board containing 80 cells, and sliding into a wooden frame, where they are further insulated by resting on pieces of thick plate glass, similarly varnished.

In describing the effects produced by this apparatus, the author draws a distinction between the static and the dynamic effects, and treats of each separately. The conclusions to which he arrives are the following:—

1. The elements constituting the voltaic battery assumed polar tension before the circuit is completed, and this even with a single cell; the polar state is shown to exist by the action on the electroscope of the respective terminals of the series; the kind of electric tension being the converse at either end.

2. When the tension thus produced is exalted by a succession of series, a succession of sparks pass between the polar extremities of the battery before their actual contact.

3. The static effects preceded, and are independent of the completion of the voltaic circuit, as well as of any perceptible development of chemical or dynamic action.

4. When the current is established, whether by actual contact of the extremities, or merely by their approximation, so as to admit of a succession of sparks, the dynamic effects on the galvanometer are the same; in the latter case each spark produces a true and proper deflection of the needle. It is hence inferred that the current, even when the circuit is closed, may be regarded as a series of discharges of electricity of tension succeeding each other with infinite rapidity.

5. In a battery, the chemical elements of which have but a feeble affinity, as in the water battery, the tension rises very slowly.

6. In order to produce static effects in a voltaic battery, it is an indispensable requisite that the elements be such as are capable of combining by their chemical affinities, and the higher those affinities are exalted, the smaller is the number of pairs in series required to exhibit the effects of tension. The static effects elicited from a voltaic series afford, therefore, direct evidence of the first step towards chemical combination, or dynamic action.

The author concludes by observing that the chemical effects obtained in most of the experiments described are very feeble, but are precisely of the same character as those exhibited by more powerful voltaic combinations; and he thinks it may fairly be concluded that the *rationale* of each is the same, and that they differ only in the amount of action.

April 18.—Mr. Gassiot communicated some further experiments on the subject of the above memoir, and described an instrument, by means of which he had been able to obtain very readily, and without even the aid of a Zamboni's pile, the effects of tension from a single cell of Grove's nitric acid battery. The instrument is a bell glass, protecting two parallel gilded discs, which are to be connected with the terminals of the cell; from the cap of the electroscope is suspended a single gold leaf between the discs; this is electrised by the induction of a rod of glass or resin, and the gold leaf approaches one or other of the discs, according as they are connected with one or other terminal. This new instrument is already coming into use; Mr. Watkins has constructed several.

On the Electrolysis of Secondary Compounds.

By J. F. Daniell, Esq., D.C.L., For. Sec. R.S., and Prof. Chem. King's College, London; and W. Millar, M.D., Demonst. of Chem. at same College.

[Read Feb. 25.]

The authors of this paper have followed up their inquiry into the phenomena of electrolysis, commencing from the point to which it had been carried by Professor Daniell, in his papers published in the Phil. Trans. for 1839 and 1840. He had there shewn that, in the electrolysis of neutral saline solutions, if the metal is one of those which do not decompose water at ordinary temperatures, it is precipitated in the metallic state at the platinode; but if it belong to the class of those which at ordinary temperatures do decompose water, then an equivalent of the oxide is liberated at the platinode, while an equivalent of hydrogen makes its escape in the gaseous form from the same electrode; the acid in both cases being, at the same time, liberated at the zincode, accompanied by an equivalent proportion of oxygen. On comparing these results with those of an independent voltameter, included in the same circuit, it was found that a certain definite proportion of the force, which resolves a single equivalent of a *simple* electrolyte into its anion and cation, produces the resolution of a full equivalent of a *complex* electrolyte into a simple metallic cation and a compound anion. When ammoniacal salts in solution were thus decomposed, ammonia, with an equivalent of hydrogen, was liberated at the platinode; while the acid, with an equivalent of oxygen, was evolved, as before, at the zincode.

Experimental evidence was thus obtained in support of two important theories, namely: the ammonium theory, advanced by Berzelius; and the binary theory of salts propounded by Davy, in which latter theory all saline compounds are regarded as being formed on the type of the hydracids. This binary composition of salts is, in the present paper, proved to exist, not only when the salts, previously held in solution by water, are decomposed by the voltaic current, but also when the fused anhydrous salt is electrolysed—for example: metallic silver in crystals is deposited upon the platinode, when fused nitrate of silver is included in the circuit.

On examining by the current, monobasic, dibasic, and tribasic phosphates, the authors found that there were three distinct modifications of the acid transferred. From the monobasic phosphates, there was obtained the metaphosphoric acid; from the dibasic salts, pyrophosphoric acid; from the tribasic salts, the ordinary phosphoric acid was set free at the zincode. The acids were transferred into weak alkaline solutions, and recognised by their appropriate tests. The view entertained by Professor Graham of the composition of these salts is, therefore, completely confirmed.

On the other hand, the authors found, by similar experiments made with the yellow and the red prussiate of potash, that only one compound of cyanogen with iron, or ferrocyanogen, as it exists in the yellow salt, is evolved at the zincode; and they not only converted the yellow into the red salt by electrolytic action, but conversely reproduced the yellow from the red.

In pursuing their researches on double salts, a new order of facts were brought to light, which clearly proved that, although the two irons of the electrolyte are always *evolved* in equivalent proportions, yet that they are not *transferred* in equivalent proportions to the respective electrodes; that some bases—such as copper, zinc, iron, and alumina—do not travel at all towards the platinode; that some—as magnesium—do so in small proportion only; and that others—as barium and potassium—are transferred in greater abundance, those whose oxides are most soluble appearing to travel most easily. On the other hand, the acids, whether forming soluble hydrates or not, seem all to travel towards the zincode, in proportions dependent principally on the nature of the base with which they are united.

The curious phenomena, which have thus been brought to light, concur in establishing the general fact, that the disengagement of the cation and anion of an electrolyte in equivalent proportion is not always effected, as is commonly represented, by their simultaneous transfer in opposite directions, to their respective electrodes, in the exact proportion of half an equivalent of each; but that it is sometimes brought about by the transfer of a whole equivalent of the anion to the zincode, whereby a whole equivalent of the cation is left uncombined at the platinode, or by the transfer of unequivalent portions of each in opposite directions, making together a whole equivalent of matter transferred either to one electrode or the other; or, in other words, by the transfer of a quantity of matter capable of exercising one equivalent of chemical force; so that when the anion transferred to the zincode exceeds half an equivalent, the cation, transferred to the platinode, is, in an equal proportion, less than half an equivalent, and *vice versâ*; the anion and cation set free being always in equal proportions. In no case, however, has there been observed the transfer of a whole equivalent of the cation to the exclusion of the anion.

These facts, the authors conceive, are irreconcilable with any of the molecular hypotheses,

which have been hitherto imagined to explain the phenomena of electrolysis.

On the Production of Ozone by Chemical Means.

By Professor SCHOENBEIN, of Bâsle.

[Read April 18th and 25th.]

The author conceives that of the two gaseous principles produced during the slow action of phosphorus on atmospheric air, and which have opposite voltaic characters, that which exerts electro-positive properties is composed of vapourised phosphorus, conjoined with particles of phosphatic acid, and the other, which is electro-negative, is identical with *ozone*, or the odoriferous principle disengaged at the positive electrode during the electrolysis of water. His opinion is founded on the odour of the one not being distinguishable from that of the other. He adduces further evidence in support of his opinions relative to the identity of the odoriferous principles during electric discharges in common air, during the electrolysis of water, and during the slow action of phosphorus upon atmospheric air. This principle, termed *ozone*, he regards as being a simple body and a constituent of azote, which he believes to be a compound of hydrogen and ozone; and he explains the disengagement of this latter element, which he considers as analogous in its chemical characters to chlorine, by the partial decomposition of azote, in consequence of its hydrogen combining with oxygen, in the several processes above mentioned, during which ozone makes its appearance.

ROYAL INSTITUTION.

On recent Improvements in the Manufacture and Silvering of Mirrors.

By Mr. FARADAY.

[Read June 7, 1844.]

Mr. Faraday's subjects were,—1, the manfacture of plate glass; 2, the *ordinary* mode of silvering mirrors; 3, the *new* method of producing this result, lately invented and patented by Mr. Drayton.

1. Mirrors are made with plate glass. Mr. Faraday described glass generally as being essentially a combination of silica with an alkaline oxide. The combination, however, presents the character of a solution rather than of a definite chemical compound; only it is difficult to affirm whether it is the silica or the oxide which is the solvent or the body dissolved. From this mutual condition of the ingredients, it follows that their product is held together by very feeble affinities; and hence, as was afterwards shown, chemical reagents will act upon these ingredients with a power which they would not have were glass a definite compound. Mr. Faraday noticed, that as glass is not the result of definite proportionals, there are many combinations of materials capable of producing a more or less perfect result. Each manufacturer, therefore, has his own recipe and process, which he considers the most valuable secret of his trade. It is, however, well known that the flint glass maker uses the oxides of lead and of sodium; the bottle glass maker, lime (an oxide of calcium); and the plate glass maker, in addition to soda, has recourse to arsenic. Mr. Faraday then adverted to the corrosions which take place in the inferior qualities of glass, owing to the feeble affinity with which their ingredients are held together. He stated, that from the surface of flint glass a very thin film of soluble alkali was washed off by the first contact of liquid, leaving a fine lamina of silica, the hard insoluble quality of which protected the substance which it covered. If, however, this crust of silica chanced to be mechanically removed, the whole of the glass became liable to corrosion, as in ancient lachrymatories and other glass vessels. Mr. Faraday illustrated this by the corroded surfaces of two bottles, one obtained from a cellar in Threadneedle street, where it had probably remained from the period of the great fire of London, and another from the wreck of the Royal George. A still more striking instance of the instability of glass as a compound was exhibited by formations in the interior of a champagne bottle, which had been filled with diluted sulphuric acid. In this case the acid had separated the silica from the inner surface of the glass, and formed a sulphate with the ingredient, lime. The result was, that the bottle became incrusted internally with cones of silica and sulphate of lime, the bases of which, extending from within outwards, had perforated the sides of the bottle so as to cause the escape of the liquor it contained. Mr. Faraday referred to the long period of annealing which glass had to undergo as a necessary consequence of glass wanting the fixity of a definite compound. He concluded this part of his subject by describing the mode of casting plates, and the successive processes which gradually produce the perfect polish of their surface.

2. Mr. Faraday next exhibited to the audience the mode of silvering glass plates as commonly practised. He bade them observe that a surface of tinfoil was first bathed with mercury, and then flooded with it; that on this tinfoil the plate of glass, having been previously cleansed with extreme care, was so floated as to exclude all dust or dirt; that this was accomplished by the intervention of $\frac{1}{8}$ in. of mercury (afterwards pressed out by heavy weights) between the reflecting surface of the amalgam of the mercury and glass; and that, when the glass and amalgam were closely brought together by the exclusion of the intervening fluid metal, the operation was completed.

3. The great subject of the evening was the invention of Mr. Drayton, which entirely dispenses with the mercury and the tin. By that gentleman's process, the mirror is, for the first time, literally speaking, *silvered*, inasmuch as silver is precipitated on it from its nitrate in the form of a brilliant lamina. The process is this:—On a plate of glass, surrounded with an edge of putty, is poured a solution of nitrate of silver in water and spirit, mixed with ammonia and the oils of cassia and of cloves. These oils precipitate the metal in somewhat the same manner as vegetable fibre does in the case of marking ink, the quantity of oil influencing the rapidity of the precipitation. Mr. Faraday here referred to Dr. Wollaston's method of precipitating the phosphate of ammonia and magnesia on the surface of a vessel containing its solution, in order to make intelligible how the deposit of silver was determined on the surface of clean glass, not (as in Dr. Wollaston's experiment) by mechanical causes, but by a sort of electric affinity. This part of Mr. Faraday's discourse was illustrated by three highly striking adaptations of Mr. Drayton's process. He first silvered a glass plate, the surface of which was cut in a ray-like pattern; 2nd, a bottle was filled with Mr. Drayton's transparent solution, which afterwards exhibited a cylindrical reflecting surface; and, 3rd, a large cell, made of two glass plates, was placed erect on the table, and filled with the same clear solution. This, though perfectly translucent in the first instance, gradually became opaque and reflecting; so that, before Mr. Faraday concluded, those of his auditors who were placed within view of it saw their own faces, or those of their near neighbours, gradually substituted for the faces of those who were seated opposite to them.—*Athenæum.*

THE PROGRESS OF PHARMACY IN GREAT BRITAIN.

Three years having elapsed since the formation of the Pharmaceutical Society, we propose to take a brief retrospect of what has been done. This will serve as a general answer to some of our correspondents, who (if we may judge from their inquiries) appear to have forgotten the circumstances which induced the chemists of this country to unite, and the purposes for which the union was effected.

In almost every civilised country the education of pharmaceutists, and the practice of pharmacy, are regulated by stringent laws, and, as well as other matters relating to the public health, are under the control of the government. In Great Britain this has never been the case; and, while the legislature has not overlooked the safety of the public in reference to medical practitioners, the compounders and vendors of medicine have been passed over, and allowed to take their own course. As a natural consequence of this oversight, a great number of uneducated persons have encroached upon the province of the chemists and druggists, who have therefore been stigmatised as a body of men possessing no legal qualification, and comprising many individuals unworthy of confidence.

Much dissatisfaction at this state of affairs had existed in the profession, for some years prior to the period to which we have just alluded. Medical reformers had already investigated the subject before a parliamentary committee, and numerous facts had been brought forward, proving that the public sustained a serious injury from the absence of proper legislation in reference to pharmacy. But the parties thus engaged were chiefly medical practitioners; and, among other complaints against the chemists, they urged, as a grievance to the profession, that medical advice was given across the counter by persons who were not only uneducated in medical practice, but who had passed no examination even in pharmacy, their own particular department.

Vigorous endeavours were therefore used to put an end to this custom, and also in other respects to place the chemists under restraints and restrictions to which they were not disposed tamely to submit.

Many of the chemists had for some time been sensible that a salutary law, with reference to their own body, was desirable, not only for their professional credit, but also for their protection against the encroachment of illiterate persons into their ranks; but no effort on their part was made until the prospect of a serious innovation on their privileges and independence obliged them to unite in self-defence. Any opposition to the progress of education in the profession, and the protection of those who had proved themselves qualified, would have been impolitic, as well as unavailing. It was therefore thought advisable for the chemists to lay the foundation of that system of education and examination for their own members, which, according to the custom of other nations, should have been done by the government. It was proposed to effect the desired result by the formation of a society, which all those already established as chemists and druggists were invited to join.

The demonstration thus made by a large proportion of the body in various parts of the kingdom, had a very decisive and striking effect at the time. The measures before Parliament which had provoked the opposition of the chemists, were speedily abandoned. The struggle between the apothecaries and the chemists gradually subsided, and the new society gained ground so fast, that a charter of incorporation was obtained within two years of its establishment. The arrangements for providing an efficient system of education and examination in pharmacy, have produced a reaction in favour of the parties concerned, who had previously been looked upon as an uneducated and disunited class of men, unworthy to be ranked as a portion of the medical profession, but who are now recognised by all parties as the legitimate representatives of the pharmaceutical department.

But the most important part of the work remains to be done, and the time is fast approaching at which the society will be in a position to take another step. The foundation of the system being laid, it must be confirmed and ratified by Act of Parliament before we can safely or consistently relax in our efforts. A voluntary society is at the mercy of the individual members who compose it; and however salutary may be its regulations—however calculated, if universally supported, to effect the object desired—its prosperity, and even its existence, may be said to be more or less in danger until it becomes the basis of a legal enactment.

The society, like any other voluntary institution of the kind, must be supported by subscriptions; and the immediate cause of alarm which, in the first instance, favoured its growth, having in some degree passed away, the inducement to continue this support is not so obvious to those who take a superficial view of the subject, as it was three years ago.

The secession of some of the members is therefore an event which might naturally be expected,

and the deficiency can only be supplied by those who are admitted by examination. But the examinations, not being enforced by Act of Parliament, are dependent upon the degree of popularity the society enjoys, and are resorted to only by those who are particularly desirous of admission. A candidate who is rejected on account of his incapacity or ignorance, may relinquish the idea of membership, and instead of being obliged to qualify himself, may commence business, although quite incompetent. Thus, the certificate of qualification, granted by the board of examiners, is at present merely an honorary distinction, not a licence to practise pharmacy.

If the society enjoyed the support of the whole trade, it would be a disgrace to evade the prescribed ordeal; and any person offering himself to the public as a chemist, without having submitted to the test, would be a marked man. In this case the examination would be almost compulsory, its influence in raising the qualifications of the members would be universal, and the fees received from candidates on examination would be sufficient to maintain the institution, without any further annual subscriptions from members and associates. In fact, if all the regular chemists and druggists in this country were united, and unanimously determined on enforcing such a system of education and examination as would ensure to the public a supply of well-qualified pharmaceutists, and protect the interests of the men so qualified, no obstacle or opposition could withstand such a concentration of influence, and an Act of Parliament would be unnecessary. Such a body could easily drive from the field any ignorant persons who might attempt to encroach upon the province of its members; the complaints which we now hear respecting the injury done to the trade by grocers, oilmen, and other persons uneducated in pharmacy, would be at an end. Pharmacy would be in the hands of an educated class of men, and, as a natural consequence, the *trade* would become an honourable *profession*.

To attain this result, the co-operation of all the regular chemists in the country would be essential, and the only obstacle to its attainment which has ever existed has been the difficulty of inducing all to co-operate. When the undertaking was at first proposed, it was considered by many persons to be chimerical and fruitless. It was said that there was in the trade no public spirit—no disposition to unite in any measures for the general benefit—that the jealousy prevailing between individuals would be an obstacle to any union among them; and it was a common remark that, even if this were to be effected, "the chemists would not pull together for six months."

Notwithstanding these forebodings, and the discouraging aspect of affairs, the attempt was made. Every effort was used to promote harmony and good feeling among the members of the trade, to discourage jealousy and disaffection, and to found a society which, while it provided for the enforcement of efficient laws respecting the education and examination of future members, afforded ample protection and immunity to those already in business.

If the undertaking had been attended with complete and absolute success, it would scarcely have been necessary to apply for an Act of Parliament: at all events, this acquisition, if thought desirable, would have been attended with little or no difficulty. If the project had been a failure, it would have been fruitless to expend any further labour upon it. But the result, while it has been sufficiently successful to afford every encouragement to persevere, has nevertheless afforded evidence that some legislative enactment is necessary.

A large proportion of the trade has come forward in support of the general interests; a system is organised which has been found by experience to work well; the body thus united has obtained an amount of influence never before enjoyed by the chemists of this country, and this influence admits of being considerably increased and beneficially exerted.

But there are still many individuals who have not responded to the general invitation of their brethren to co-operate in this important work. There are some even among our own members who have not sufficient penetration to appreciate the benefit to be derived from the union of individuals for mutual protection and advantage, and who request the favour of an arithmetical balance-sheet, shewing the per centage of profit which they may expect to obtain on the amount of subscription paid to the association! Such information might, with equal propriety, be asked with reference to the police rate, the paving and lighting rate, the sewers' rate, the charges for insurance, and other claims of the parishes or the government for social protection and accommodation, the precise value of which cannot be calculated in figures, although the comfort of the public and the protection of property are dependent upon the existence of such arrangements.

There may be a few individuals who are disaffected from interested motives, under the idea that, by going against the stream, they may push themselves into notoriety. Such persons will find their level sooner or later.

If any argument were necessary to shew the importance of unity of purpose and concentration of influence in the attainment of any public benefit, we need only refer to the progress of reform in the medical profession. For upwards of ten years the whole profession has been agitated with the cry of medical reform. Year after year the subject is brought before Parliament. One bill after another is brought in and thrown out. The government has undertaken to bring in a bill—for two years the profession has been anxiously awaiting its arrival, and it was fully expected that it would have been passed last session; but at the present time it is uncertain whether it will not be deferred for another year, and, even if it were to make its appearance immediately, it is doubtful whether it could be passed before the termination of the session.

It is not to be supposed that this extreme difficulty in framing and passing a medical bill arises from any want of zeal in the legislature, or from extraneous opposition. The Houses of Parliament would readily support any salutary measure which enjoyed the sanction and support of the profession. The public would offer no opposition to such a measure, being interested in its adoption.

But the profession is divided against itself. The measures brought forward by one party are opposed by another, and while all are interested in the establishment of regulations for the *advancement of professional education*, and the *protection of qualified practitioners*, which are the leading objects of medical legislation, the difference of opinion existing among the parties concerned, as to the details of arrangement, have hitherto been an insurmountable obstacle to the attainment of the desired result, and the whole profession has suffered for want of that unanimity which would have secured a complete and easy triumph.

The chemists are not divided into several parties. Those who take an interest in the concerns of the body at large are working harmoniously together; and if they avoid the evils of internal dissension, and continue to advance steadily and unanimously, there is no reason to fear opposition either in Parliament or in any other quarter.—[We transfer this defence from the pages of the "Pharmaceutical Journal;" we append a different view of matters from the columns of the "Chemist," which, to prevent its being passed unread, we should mention is *not* editorial.—Ed.]

Gentlemen,—If you will refer to the Pharmaceutical Transactions published on the 1st of June, you will find that some persons have made the very reasonable inquiry, "When does the Council intend to apply to Parliament for a bill to protect qualified chemists and druggists?" The answer given is concise: "*As soon as the proper time arrives.*" In reading, it is sometimes the case that a particular sentence makes such a strong impression on the mind, that we find it pressing itself upon our notice at times and in places when and where we did not expect it. This same sentence, "as soon as the proper time arrives," had this peculiar effect on me, and I found myself frequently wondering when this proper time was likely to come; and this has induced me to look more closely into the progress and present financial position of the Pharmaceutical Society, and to reckon how much the druggists of this country have paid for their cap and bells. It will, perhaps, be as well for me to confess myself a country druggist, living in a small market-town, and that I have paid four annual subscriptions to the Pharmaceutical Society, amounting to eight guineas; the young gentlemen in my shop have also contributed other six guineas. If I were asked why I have contributed these eight guineas, and countenanced the paying of the other six, I should first impress upon the person asking such a question that I did not pay it or join the Pharmaceutical Society from any fear of Mr. Hawes' Medical Reform Bill; neither do I continue to pay two guineas a year for the purpose of assisting in "uniting the chemists and druggists into one ostensible, recognised, and independent body, for protecting their general interests," if by their general interests be meant the perpetuation of their encroachment on the province of the regularly-educated medical practitioner, and their dabbling in a science for which they are not qualified; but I have hitherto paid my two guineas per annum with the hope and expectation of seeing it applied to "the advancement of pharmacy, by furnishing an uniform system of education;" and as this was one of the avowed objects for which the society was formed, it is surely not premature, in the fourth year of its existence, to inquire how far there is expectation of this object being accomplished? The *Journal* says, "as soon as the proper time arrives." This, of course, implies that the proper time has not yet "arrived." Well, then, in the fourth year of its existence, after having received (if we estimate the present year's income by the last) over £20,000, what is the society effecting in the way of furnishing this "uniform system of education?" Can you, Gentlemen, answer this question? Is not the proper time come, when £20,000 have been subscribed, and when between £8,000 and £9,000 of those subscriptions are quietly placed aside in the Funds? Is it sufficient for the wants of our profession that a course, or that courses, of lectures are given? I admit the high talent of most of the gentlemen who deliver those lectures; but if Liebig, Faraday, Graham, Brande, and all the others whose names are famous in the science, stood in the society's rooms daily, and lectured without ceasing, they would fail to teach chemistry, unless they combined practice with their theory. But to shift my position from generals to particulars. A short time since, a young gentleman, who had completed his term of apprenticeship with me, went to London, with a view of carrying forward his chemical education; he had been a subscriber to the Pharmaceutical Society from the first; he had carefully read and studied all its printed Transactions; he had had the advantage of a good library of chemical works, and almost every English periodical devoted to the science; he had had time and opportunities offered him for study, and he had taken advantage of these. I am one of those who subscribe to the opinion expressed by Mr. Bullock in his lecture reported in your last, that "*the man who prepares a prescription ought to be capable of making an analysis.*" Now, had the Pharmaceutical Society established a school of chemistry, and employed in it well-qualified men—and there are many such to be found—gentlemen, the chief business of whose lives has been to gather knowledge, and impart it to others in the most useful method; had there existed the means of this young man employing the whole of the day in the study and practice of chemistry on the society's premises, he would undoubtedly have enrolled himself among the number of students. As it is, he contributes towards its yearly income, pays towards and attends its lectures, and is obliged to study practical chemistry elsewhere. Do you think this a solitary instance? Would not every chemist, druggist, or pharmaceutist (by whatever name you like, for chemists are scarce, though druggists are manifold), be glad to have some authorised school or college to which his pupils could repair

for the completion of their education, where they could be instructed at a somewhat less cost than they are now obliged to incur, as private pupils, in the laboratory of some professor, at a cost of £100 or £150 per annum? But, perhaps, the *proper* time has not yet arrived.

In the year 1842, a very excellent letter was published by Dr. Gregory, Professor of Chemistry at Aberdeen, addressed to the Earl of Aberdeen, "On the State of the Schools of Chemistry in the United Kingdom;" this letter has, doubtless, been read by most of your subscribers; and I would take the liberty of recommending it to the careful perusal of every subscriber to the Pharmaceutical Society. The Professor, in the commencement of this letter, sets forth, in a very striking and lively manner, the importance of our science;* expresses his regret at the imperfection of the schools of chemistry in this country, and points attention to the school in the University of Giessen, built and furnished under the superintendence of Professor Liebig. On the point of expenses, Dr. Gregory remarks, "The absolutely necessary expenses of a laboratory may be classed under three heads:

"1. The original outlay in building and furnishing the laboratory.

"2. The annual outlay for materials, and for the wear and tear of apparatus, and for fuel.

"3. The salaries of an assistant and servant, &c."

We find in this letter that the cost of building the laboratory, including all furnaces, sand-baths, water-pipes, and the numerous indispensable fixtures, was about £1,120, and it is accommodating fifty practical students. The annual expense, when the pupils did not exceed fifteen, was £130, or at the rate of £8 13s. 4d. per pupil.

The salaries of an assistant and servant are paid by the government, as are most of the other expenses. The Professor has a handsome salary and a free house. The fees paid by working pupils are calculated according to the number of days per week employed in the laboratory. Those who work one day per week during the course pay about £1 2s.—for every additional day the charge is the same; but most of the students work six days per week, and pay about £6 14s. for the course, the length of which is from eight to nine months.

From these extracts it appears—

1st. That a laboratory, capable of accommodating fifty pupils, can be built and furnished for about £1,200. 2nd. That the expenses of maintaining a laboratory is about £9 for each pupil studying therein.

Then, as the government of this country is not at all likely to furnish funds for the support of a chemical school, we must look entirely to the students. Suppose, then, that to the cost of maintaining the laboratory were added such a further sum as would be deemed sufficient to pay the salaries of professor, assistants, servants, &c., and this further sum charged on the pupils—for instance, add another £15 to the £9, making £24 for the eight months' course of practical chemistry;—of this £15, one-third might be devoted to the professor as his salary, and the other two-thirds divided among his assistants and servants.

In the year 1843, there were upwards of 3,600 subscribers to the Pharmaceutical Society. Supposing, for illustration, that this was the outside number of persons who could be compelled to qualify themselves for the practice of pharmacy, then, as we may calculate that the average duration of these persons will not exceed 40 years, it will shew 90 students always under tuition, even if none study more than one season.

But would it be wise to leave it to the choice of young men (or to their parents) whether they should study practical chemistry under experienced professors, or set themselves down as vendors of drugs, without having obtained the necessary qualifications? Surely not; the education should be compulsory, and a parent, when placing his son in this business, should know that it involved the expense of the young man studying at the authorised and acknowledged school. But perhaps it is the intention of the Council of the Pharmaceutical Society to do something better than all this "when the proper time arrives." Well, then, when will this important time arrive? What delays it? Are not four years sufficient to digest and mature plans? Is not a capital of £8,000, and nearly 4,000 subscribing members, sufficient to inspire the timid Council with enough confidence to apply to Parliament? If these things are not enough, can you, Gentlemen, tell me what they wait for? I trust they will no longer delay, but awake, arise, and shew that they are earnest for the extension of a knowledge of practical chemistry. If they delay longer, will not their country brethren have cause to suspect that it is love of their present power and position, and fear of losing this power; and clearly foreseeing that a school of chemistry once established by law would swallow up all necessity for the present Pharmaceutical Society, that keeps them from the good work. If they longer delay, all those who now entertain an erroneous impression of the powers and privileges conferred on the society by the charter (the *costly* charter), and all those who have hitherto entertained fears lest legislative enactments should be retrospective, will have come to right conclusions on these points, and, fear no longer influencing their judgments, they will withdraw their subscriptions.

As I have now trespassed at great length on your space, I will for the present close my remarks with some extracts from the financial reports of the society.

In the first year, 1841, the income of the society was £1,944 11s., and was derived from 934 subscriptions, some donations, &c. &c. The expenditure was £279 16s. 3d.

The first three months of the year 1842, the society's income was £3,220 18s. 2d., and derived from 1,960 subscriptions, premium on exchequer bills, donations, &c. &c.

The expenditure for these three months was £867 18s. 4d.; at this period of the society's affairs, we find £2,991 5s. invested in the public funds; also £871 3s. 3d. transferred from the Druggists' Association Fund of 1815.

The Pharmaceutical Transactions in 1841 cost £50 per number; there were then 934 subscribers.

They also cost £50 per number in the first three months of 1842, when there were 1,000 more subscribers.

The income of the society from the 1st of May to the 31st of December, 1842, amounted to £3,149 2s. 8d. and was derived from 2,029 subscriptions, donations, entrance fees, registrations, interest on stock, &c. &c.

The total number of subscribers this year was 3,971, and the gross income £6,369 10d.; for the last eight months of the year the *Journal* cost £1,078, or nearly £135 per month, or about 5s. 6d. for each subscriber for the eight months.

Out of this eight months' income there was invested in the public funds the sum of £1,838 2s.; the amount paid away for rent and rates was £224 9s. 9d. The expenses of the lectures exceeded the amount of receipts from pupils by 10s. 4d.

In the year 1843, the receipts of the society amounted to £6,438 1s. 5d., and was derived from 3,634 subscribers, together with donations, interest, fees of admission to lectures, registrations, &c. &c.

Out of this, £2,445 3s. 7d. was invested in the public funds. This year there is a falling off of 325 subscribers, 23 of whom were members, and 302 associates; there is an addition of 5 life members; the total number connected with the society was 3,651. The *Journal* cost, with its delivery, £1,293 1s. 2d., or a trifle above 7s. for each subscriber; the school of pharmacy, which, I suppose, means the lecturers' fees, cost £577 14s.; the receipts from pupils who attended those lectures, £207 7s. 6d.; loss, £370 7s. 6d. The charter cost £667 19s. *Travelling expenses* of county members of Council, £20 15s. 6d.; rent, rates, &c., £355 10s. 5d.; advances to branch schools in the country, £221 10s.; and the acount closes with the treasurer having advanced £1,351 15s. 11d. for the use of the society, which of course has been paid out of this year's subscriptions, and we shall know all about next June.

In the foregoing I have written nothing but what I have gathered from the printed reports of the society; if, in any point, I am in error, it has not been intentional, but proceeds from not clearly understanding the statements printed. I think I am substantially correct in all I have advanced; and now, Gentlemen, when will the proper time arrive for establishing "an uniform system of education?"

I am, Gentlemen,
Respectfully yours, &c.,
A Country Druggist.

* Much that is pleasing and instructive will also be found by your young readers in Prof. Liebig's "Familiar Letters on Chemistry." 1844.

UPON THE ORDINARY DISEASES AND MODE OF PRESERVING LEECHES.

By J. F. Rabbe.

The great mortality which has prevailed among leeches, especially during the last few years, is ascribed by the author to an incautious mode of collecting them—to a long and improper transport—to a faulty method of keeping—and to carelessness in rearing. The diseases of leeches, arising from these causes, are of a contagious nature, and may in a few days determine a considerable mortality in their numbers. The following have been observed by the author:—1st. The knotty disease (*knutsjukan*). The animal has posteriorly a peculiar appearance, and seems in several places as if constricted by a fine thread. Within the body, particularly towards the back part, small indurations of coagulated blood are met with, which are moveable, and of the bigness of a grain of mustard. The constricted parts are uniformly crippled, while the other portions remain sound. The leech may continue to live in this state one or two days. On close examination, the integument is found corrugated from before backwards, eventually forming a fine cord, whereby the leech is constricted. When, at the commencement, the leech is frequently supplied with soft water, in which some sugar is dissolved, it may be preserved a longer period. The disease is common at the time of pairing, that is, from April to June, but, likewise, at other times from inattention, &c.—2d. The tinged or yellow discase (*rött eller gellsjukan*). In this affection there is an equable swelling of both head and tail, the virile member is at the same time protruded from the anus, the whole body swells, and the blood becomes corrupted. Convulsions at length set in, followed by death. This is the most dangerous disease, and proves fatal within a few hours. It is induced by ammoniacal vapour, but sometimes from other causes. Ammonia is a most deadly poison to leeches; hence its exhalations are a frequent source of death in chemists' shops. This disease is incurable when the tail-end of the animal is the first to swell. Here, it is proper to puncture the swelling with a needle, then squeeze out the tainted blood, and place the annelid in tepid water. Washing it in water also, to which one-thirtieth of vinegar has been added, or in tepid milk, is advantageous. —3d. The buccal disease (*muusvullnad*). Leeches are frequently injured when gathered, in consequence of being roughly torn away from the spots where they have been sucking. The result is the formation of a swelling after a while in the mouth, and the animal dies from the head to the tail. This also takes place when the leeches shortly before deportation have swallowed a quantity of blood. When such leeches are huddled together with healthy ones, the latter get diseased, probably in consequence of the pollution of the water so occasioned.—4th. The mucous disease (*slemojukan*). The leeches have a miscrable look, are covered with a whitish slime, giving the water the appearance of a linseed decoction; they are dull, and die usually in about three days from behind forwards. He believes this disease to proceed from hindrance to laying their eggs during transport. He has noticed it from the end of June till August. Possibly, also, interrupted cutaneous exhalation may be a cause.

With regard to the preservation of leeches, the author recommends, after removing the dead or diseased ones, to place the others, to the number of from thirty to fifty, in a glass vessel, capable of holding a pint, filled two-thirds with river or rain water, slowly poured in along the side of the vessel. The water should have a temperature suitable to the season of the year. The vessel ought to be closed with a piece of clean linen, not washed with soap, and set in a cool, shady, and well-aired situation. The water should be changed in winter every three days, and in summer every other day, taking care each time to pick out any that are dead or diseased. By following the above plan, the author states that, in the year 1842, out of 1460 leeches, he lost only eighteen.—*Finska Läkare Sällskapets Handlingar. Första Baudet. Tredje Häftel. Helsingfors.* 1842.

ON THE DECOMPOSITION OF THE IODIDE OF IRON AND ITS SYRUP.

By Richard Phillips, Jun.

The iodide of iron, as is well known, undergoes decomposition immediately after preparation, and even during it, although every care be taken in its manufacture. It has, however, been found, and I believe it was first proposed by Mr. Squire, in the *Philosophical Magazine*, that if a coil of iron wire be placed in a solution of it, although sesquioxide of iron is precipitated, no decomposition by which iodine is set free takes place; whilst if the iron wire be not present, both of these decompositions take place.

The usual manner, I believe, of accounting for both these decompositions is, that the iodide of iron becomes decomposed by the action of the atmosphere, the iron gaining oxygen from it, and, consequently, the iodine being set free, and then the iodine liberated reacts upon the iron wire. Nothing can appear clearer than this statement, although, as I hope to shew, it is not borne out by experiment; and I must preface my observations by stating, that iodide of iron, as prepared according to the Pharmacopœia, is hydrated, containing one atom of iodide of iron and five atoms of water; and that in this form it most readily attracts moisture from the atmosphere. If a solution of iodide of iron, even recently prepared, be examined, it will be found to be acid to litmus paper, although, at the same time, but little sesquioxide of iron be precipitated, or iodine set free; after, however, exposure to the air, as the solution becomes more acid, they become apparent. Now, according to the present theory, no acid could be formed; and there being only iodine, iron, and water present, this acid must be either hydriodic or iodic, the former resulting from the decomposition of the water (its hydrogen uniting with the iodine), and the latter from the absorption of the oxygen of the air. By Mr. Scanlan's test of starch, and tartaric acid, I found it to be hydriodic, as, on the merest trace of iodic acid being added, a black precipitate was formed. This test is strengthened by the fact, that if it were iodic acid, no iodine would be liberated. This view also appears to me to account more easily for the action of the iron wire, as I have found by experiment that if a weak cold solution of iodine be allowed to act upon it, hardly any decomposition takes place. I therefore believe that when iodide of iron is decomposed, it first results from the decomposition of the water present, its hydrogen acting, as already stated, to form hydriodic acid, and its oxygen combining with the iron to form protoxide of iron, which latter, gaining oxygen from the air, becomes peroxide. The liberation of the iodine is easily accounted for by the well-known decomposition of hydriodic acid when exposed to the action of air and light.

The April number of this journal contains a paper by the Messrs. Smith, "On the Syrup of the Iodide of Iron," in which they throw out some speculations regarding its decomposition, considering it probable that the iron becomes peroxidized, and that it is held in solution through the formation of some vegetable acid, such as acetic, formic, or oxalic. In the May number of the *Chemist*, there is also a paper by Mr. William Onion on this subject, in which he states his opinion that part of the iron becomes peroxidized, and forms a saccharate of iron by uniting with the sugar, and that the remainder of the iron is converted into a sesqui-iodide, part of the iodine being set free. From my experiments, however, I am led to the conclusion that the same decomposition occurs in the syrup as in the iodide, and I think the changes which take place in it after its formation, are fully accounted for by this view.

Sugar, and some other substances, such as gum, exercise a well-known remarkable power in the prevention of the further decomposition of bodies; this fact is well illustrated by the saccharated protocarbonate of iron, in which the sugar, preventing any alteration of the state in which the iron exists, keeps it as a protocarbonate. It is also a fact well worthy of attention, that if a solution of a per- or protochloride of iron be mixed with syrup, when liquid ammonia is added to it no precipitation takes place. I have, however, found, in the case of the saccharated protocarbonate of iron, that after long exposure to the air, the surfaces exposed become peroxidized.

The syrup, in the same manner as the iodide, becomes, even when not exposed to the action of the air, slightly acid, assuming at the same time a greenish appearance; on exposure it becomes of a brownish colour, its quantity of acid being increased, and, according to Mr. Onion, after having been kept for some months exposed, a black deposit takes place.

Now, if we suppose that, on account of the action of the syrup, the iodide of iron is but slowly decomposed into hydriodic acid and protoxide of iron, and that, on the same account, both of these are prevented, at least to a certain extent, from further decomposition, the syrup holding the latter in solution, the acidity and greenish colour of the syrup first observed are, I think, accounted for. In process of time, however, by exposure to the air, the hydriodic acid becomes decomposed, yielding iodine, and the protoxide of iron is converted into sesquioxide, the latter still being held in solution by the syrup; and in these latter conclusions I am fully borne out, both by my own experiments and those of the gentlemen I have mentioned. Mr. Onion found that when the syrup became of a dark colour, iodine was set free, and that a persalt of iron was formed, although, I should conclude from his experiments and my own, to no great extent. They agree that the dark colour of the syrup, after exposure, is owing to the formation of a persalt of iron. Now, although this might in some degree contribute to it, still I should consider that it is principally due to the liberated iodine which is held in solution, part of which would, without doubt, as Mr. Onion found, be precipitated after long exposure.—*Pharmaceutical Journal.*

NEW FORMULÆ.

(From Neligan's New Work on Medicines, their Uses, &c.)

[Continued from page 53.]

Copaibæ, f℥iij; Solutionis Alkalinæ (Brandish), f℥iss; Tere bene simul in mortario vitreo, dein adde inter terendum, Syrupi Limonum, f℥ss. Fiat mistura, capiat cochleare minimum ter in die ex cyatho aquæ. (This is an excellent form for administering copaiva.)

Iodinii, gr. iv; Ætheris sulphurici, f℥i. Solve. Capiat guttas decem ter in die. (This is Magendie's etherial tincture of iodine.)

Potassii Bromidi, gr. xv; Aquæ Florum Aurantii, f℥iij; Syrupi Aurantii, f℥j. M. Fiat mistura, cujus capiat partem quartam sextâ quâque horâ. (In chronic enlargements of the liver and spleen.)

Olei Morrhuæ, f℥iv; Aquæ Potassæ Carbonatis, f℥ss; Syrupi Limonum, f℥ij; Aquæ Carui, f℥iss; Spiritus Carui, f℥ss. M. Fiat mistura cujus sumantur cochlearia ampla duo ter in die. (In cases in which cod-liver oil is indicated.)

Olei Morrhuæ, f℥ss; Liquoris Potassæ, f℥ss; Adipis præparati, q. s. M. Fiat unguentum, sæpè utendum. (In scrofulous ulcerations, and in obstinate cutaneous diseases.)

Strychniæ, gr. j; Acidi Sulphurici diluti, min. ij; Spiritus Vini Rectificati, f℥j; Aquæ Destillatæ, f℥xj. M. Fiat solutio, cujus capiat cochleare minimum ter in die. (Each fluid drachm contains a twelfth of a grain of strychnia in the state of sulphate.)

Strychniæ, gr. j; Acidi Acetici, min. iv; Spiritus Vini Rectificati, f℥j. M. Fiat solutio, cujus sumantur min. v. ter in die. (Every five minims contain a twelfth of a grain of strychnia in the state of acetate.)

Strychniæ, ℥ss; Olei Olivæ, f℥iss. M. (Ten drops to be rubbed over the temples three or four times a day, in cases of amaurosis depending on paralysis of the optic nerve.)

Potassii Bromidi, ℥ss; Adipis Præparati, ℥i; Brominei, min. vj. M. Fiat unguentum. (About the size of a nut of this ointment should be rubbed over chronic glandular enlargements, twice daily.)

Tonics.—Argenti Nitratis, gr. ij; Fellis Bovini inspissati; Extracti Chamæmeli, ana, ℥ss. M. Divide in pilulas duodecim, quarum sumatur una mane meridieque. (In chronic affections of the stomach accompanied with much pain, but without organic disease.)

Argenti Oxydi, gr. vj; Extracti Artemisiæ Absinthii, ℥j. M. Divide in pilulas xij e quibus sumatur una ter in die. (In angina pectoris, epilepsy, chorea, &c.)

Iodinei Liquoris compositi (E.), f℥ss; Liquoris Arsenicalis, f℥iss. M. Fiat mistura, cujus capiat min. v. ter in die e cyatho vinario misturæ sequentis.

Infusi Absinthii; Syrupi Aurantii, ana, f℥iv. M. (This combination of iodine and arsenite of potash will be found very effectual in the treatment of chronic cutaneous affections of a scaly character.)

Bismuthi Subnitratis, gr. l; Pilulæ Colocynthidis compositi, ℈i; Syrupi Zingiberis, q. s. M. Fiant pilulæ xxiv quarum capiat duas mane meridieque. (In pyrosis with constipation.)

Cetrarin, gr. xxiv; Extracti Calumbæ, ℥ss. M. Divide in pilulas xij quarum sumatur una quartâ quâque horâ per dies duos, febre aggrediente. (An excellent febrifuge.)

Tincturæ Chirettæ, f℥ss; Liquoris Cinchonæ, f℥ij; Infusi Cascarillæ, f℥viss; Syrupi Aurantii, f℥vj. M. Fiat mistura, cujus capiat cochlearia ampla duo ter in die. (An excellent tonic mixture in convalescence from acute diseases.)

Quinæ Muriatis, gr. xij; Acidi Muriatici diluti, min. v; Aquæ Destillatæ, f℥vj; Syrupi Florum Aurantii, f℥ij. M. Fiat mistura, capiat cochlearia ampla duo ter in die. (A useful tonic mixture in chronic debility.)

Ferri Ammonio-tartratis, ℈ij; Aquæ Destillatæ, f℥vj; Syrupi Hemidesmi, f℥ij. M. Fiat mistura, cujus capiat cochlearia ampla duo ter in die. (A mild chalybeate tonic.)

Ferri Carbonatis Saccharati, ℥ss; Pulveris Myrrhæ, gr. xxiv; Pulveris Aromatici, ℥ss. M. Divide in partes æquales duodecim, quarum sumatur una ter in die. (An excellent combination in the protracted diarrhœas of infancy and childhood.)

Ferri iodidi, ℥ss; Croci, in pulvere, ℥ij; Sacchari puri, ℥iv. M. Fiant Trochisci, No. 120; sumantur sex usque ad decem quotidie; Pierquin. (An agreeable mode of administering the iodide of iron in amenorrhœa and chlorosis.)

Salicin, gr. xvj; Infusi Gentianæ compositi, f℥vj; Syrupi Hemidesmi, f℥ij. M. Capiat cochlearia ampla duo ter in die. (An excellent tonic in diseases of the digestive organs.)

Salicin, ℈ij; Pulveris Aromatici, ℥j. M. Divide in partes æquales duodecim, quarum capiat unam quartâ quâque horâ per dies duos, febre aggrediente. (An excellent substitute for disulphate of quina.)

Cyanide of Silver.—Nitrate of silver, 18 drachms; dilute hydrocyanic acid, 1 pint; distilled water, 1 pint. Dissolve the nitrate in the water, then add the acid, wash the precipitate, and dry.

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SUMMARY.

ANNUAIRE DE THERAPEUTIQUE FOR 1844. TRANSLATED FROM THE FRENCH OF DR. A. BOUCHARDAT, ASSISTANT PROFESSOR OF THE FACULTY OF MEDICINE AT PARIS, PRINCIPAL PHARMACIEN AT THE HÔTEL-DIEU, &c.

Surgical Pharmacology, Miscellanea, &c.: Note on Common Sparadrap; Common Sparadrap; Sparadrap with Colophane; Agglutinative Percaline; Liston's Sparadrap; Agglutinative Bandage, with Caoutchouc; Employment of Caoutchouc to arrest the Hæmorrhage from Leech-bites; on an Improved Preparation of Ointments; Bougies and Suppositories of Dr. Leclerc; Arsenical Paste of Frère Côme; Cauterisations employed to Prevent and Cure Phlebitis and Purulent Infection; Treatment of Malignant Pustule; Caustic Pommade; Use of Sulphate of Copper in producing the Cicatrisation of Ulcers; Revulsive Caoutchouc; Balsam for Chilblains; Remarks on the treatment of Tinea; Ointment against Tinea Capitis; Liniment against Burns; Treatment of Inflammation and Abscess of the Breast, by Compression; On a means of arresting Nasal Hæmorrhage; Moxas of Marmoral; Croton Oil Plaster: Reflections on the use of Croton Oil; Use of Ammoniacal Caustic in Amaurosis; Use of the Ammoniacal Caustic in Lupus.—Veterinary Pharmacy: Liquid against Pietin; Kusic Powder; Liquid against Pietin; Another Preparation against Pietin; Liquor for Preserving Animals.—Toxicology: Poisoning by *Aconitum Napellus;* Poisoning by Absorption of Corrosive Sublimate.—Lithontriptics: Report of Messrs. Gay Lussac and Pellouze on the Solution of Urinary Concretions; Lithontriptic Action of the Gastric Juice 88-93

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ANNUAIRE DE THERAPEUTIQUE
For 1844.

Translated from the French of Dr. A. Bouchardat, Assistant Professor at the Faculty of Medicine at Paris, Principal Pharmacien at the Hôtel-Dieu, &c.

[Continued from p. 63.]

Surgical Pharmacology: Miscellanea, &c.—*Note on Common Sparadrap.*—The numerous compound ointments and plasters with which the old pharmacopœias were encumbered, have almost entirely disappeared from practice. The pharmaceutical arsenal of the surgeon is greatly reduced; but there is a preparation which is used much more extensively than formerly. When M. Bouchardat became attached to the Hôtel-Dieu ten years ago, he used every month twelve kilogrammes of plaster for sparadrap. This quantity has been progressively increased to fifteen, twenty, twenty-five, and even forty kilogrammes monthly. It is very important for the surgeon to have the best sparadrap possible at his disposal. When it is of good quality, the dressings are much more easy, and the reunion of wounds by the first intention much more certain. The sparadrap which is sold in shops in town is in general not so good as that which is employed in the hospitals. We shall examine successively the different kinds of sparadrap that have been recommended, and we shall afterwards enter into practical details, which are indispensable to secure the proper preparation of this important article. In the first place, with respect to the choice of the plaster: the gum diachylon plaster is exclusively used in hospitals. It is of a fine yellowish color; has a rather agreeable odour; and is of good consistence. It is sometimes necessary to add a small quantity of turpentine during the exceedingly cold weather; but this addition is almost always unnecessary.

The formula of gum diachylon plaster may doubtlessly be simplified without depriving it of any of its good qualities. Burgundy pitch is a product so often impure, that it may be replaced by good turpentine, and the sagapenum is so often adulterated, that it may be altogether omitted, the quantity of the other gum resins being increased. Notwithstanding these remarks, the gum diachylon constitutes a very adhesive emplastic mass, of a good consistence, and very rarely causes erysipelas.

M. Lévin has proposed the following formula for a plaster, to supply the place of sparadrap:—Forty grammes of resin elemi, and forty grammes of fine turpentine, melted together at a gentle heat, strained, and then fifteen grammes of white wax, fifteen grammes of yellow wax, and fifty grammes of simple plaster added, melted together at a gentle heat, and intimately mixed. This forms a good plaster, and a very adhesive sparadrap of a pleasant odour is produced with it. It has been used for some time successfully in the Hôtel-Dieu. The only objection that can be offered to it is, that the resin elemi is often rare and expensive, and that the large proportion of resinous matters might cause, in certain circumstances, an excitement which might favour the development of erysipelas; it might also be anticipated that the absence of gum-resins might render the sparadrap rather less adhesive than that of diachylon.

M. Schaenffele has proposed the following plaster to be used instead of sparadrap: two hundred grammes of colophane, two hundred grammes of resin, two hundred grammes of gum ammoniacum, ten grammes of sagapenum, ten grammes of galbanum, sixty grammes of turpentine, sixty grammes of simple plaster, and two hundred grammes of yellow wax. It is important not to melt these substances at too intense heat, to give time for the melting the gum-resins, to employ a cloth with large meshes to spread the plaster on, to warm the knife but slightly, to calender the cloth by two pieces at a time, and to spread the plaster on the sides not rubbed by the cylinders of the calender. Four or five layers are sufficient. Sparadrap prepared according to this formula keeps for a long time supple, brilliant, and adhesive. M. Schaenffele practises in the midst of a hard-working population, where the utility of good sparadrap is often experienced. That which he recommends has always been found to be of excellent quality.

The choice of the cloth is a very important thing in the preparation of sparadrap. Some pharmaciens, with the view of obtaining a product which may be pleasing to the eye, choose either a very fine and close linen, or else very fine, smooth, and dressed calico. This is a great mistake. It is of the utmost importance to select a piece of unbleached calico, which has not undergone any preparation, is very strong, and is covered with a very apparent and full down. The down is of great service in retaining the plaster, and preventing it breaking off in scales,—a very annoying occurrence when a dressing of importance is practised. Some plaster spreaders propose spreading the plaster on tissue. The plan adopted in hospitals is very simple, and very good withal. It consists in spreading the sparadrap by means of a knife with a straight blade. The bands of cloth are secured at each end by a kind of comb with teeth, and held by two assistants, who keep them very tense. The melted plaster, in as cool a state as convenient, is then poured on at one end, and spread over its entire length with a knife slightly heated, which is passed over it several times in order that the layer may be quite uniform and thick enough. This is generally too light for civil practice, to supply which there are regular manufacturers, who cannot, therefore, rectify a too thinly-spread bandage.

It is important to remark that sparadrap should be frequently renewed, at least twice a month, as it is quickly decomposed when exposed to the air. The gum-resins and the oleo-resins are modified, and become fragile; the simple plaster itself is altered in character, and the sparadrap breaks off in scales, which is very annoying. It is also requisite to avoid rolling it up too closely; for if the layer of plaster is thick enough, that alone is sufficient to spoil the sparadrap. *** The observations, from which the preceding is an abstract, were published by M. Bouchardat in the *Journal de Chirurgie*, since which several new formulæ and remarks have appeared.

M. Mille prefers the diachylon plaster, but he adds caoutchouc to it, to increase its tenacity. He prepares it in the following manner. After having cut up the caoutchouc into little bits with a wet knife, he sets it to digest in ten times its weight of rectified essence of turpentine in a sand-bath. The operation is a long one, and requires an additional quantity of the essence; but, when it is almost completed, it may be abandoned altogether to the heat of the stove: the caoutchouc ultimately dissolves, the excess of the solvent is evaporated, and the mixture assumes a syrupy consistence. Twenty grammes of this solution are added to every five hundred grammes of the gum diachylon.

Common Sparadrap (F. H. Lyon).—One hundred and sixty grammes of white wax, 80 grammes of oil of sweet almonds, 20 grammes of turpentine.

Sparadrap with Colophane (V. Garnier).—One thousand grammes of simple plaster, 300 grammes of colophane, 300 grammes of oil of sweet almonds. These substances are to be heated together, until the mass has obtained the deep yellow colour so desirable for sparadrap, and then strained through linen. This composition is simple, and offers the advantage of not containing any irritating substance. It is readily preserved, and does not break off in scales.

Agglutinative Percaline (Hospitals of Algiers). The editors of the *Repertoire des Progrès Médicales* have made known a new agglutinative tissue, which very advantageously replaces sparadrap in the hospitals of Algiers. With the exception of the tissue on which the plaster is spread, there is not any difference, either in the substances employed, or in the mode of preparation, between the adhesive percaline and the English court plaster of the Codex: the silk tissue is replaced by white or black percaline. This sparadrap has the advantage of adhering strongly to the skin, especially if, at the moment before its application, it is dipped in warm water. It is especially adapted for wounds, or after amputations and other operations, when immediate reunion is desired.

Liston's Sparadrap (Calvert).—In order to prepare this, thirty-one grammes of isinglass are left in contact for an hour or two with sixty-two grammes of water, until the isinglass is quite softened; sixty-three grammes of alcohol, at 0·838, previously mixed with forty-six grammes of water, are then poured on it; the mixture is heated in a water-bath, and the isinglass is melted in a few minutes. Court-plaster, carefully spread out on a piece of wood, is then covered with a layer of this preparation by means of a brush; but it is requisite to take the precaution to unite the matter well as it is applied, and to use the brush always in the same direction, as is practised in varnishing pictures. When the first layer is quite dry a second is laid on, the brush being used in a direction contrary to the first; and these operations may be repeated four or five times if the surface be not perfectly smooth. The solution of isinglass should be diluted with a little alcohol and water for the last layer. Thirty grammes of isinglass are sufficient to prepare a metre of sparadrap. Mr. Liston uses this sparadrap in all his surgical operations. It is not employed in the hospitals in Paris.

Agglutinative Bandage, with Caoutchouc (Kemmerer).—A piece of India-rubber is touched with a cautery at a white heat, and it immediately melts into a soft mass. A piece of glass, the width of the cloth, is then used to compress and crush the softened mass, which is forced to spread out between the cloth and itself. As it adheres very strongly to the cloth, and on the contrary very slightly to the vitreous surface, it is always easy to take away the latter, and separate it from the smooth surface of the bandage.

Employment of Caoutchouc to arrest the Hæmorrhage from Leech-bites (Berthold).—A piece of caoutchouc is cut about a line thick, and five or six long and wide; one end is placed in the flame of a candle so as to melt its surface; it is then allowed to cool, and gently rubbed on Joseph paper to render its surface smooth, after which it is applied to the bite, which had been previously compressed for a few seconds, and the blood cleared away. The little bit of caoutchouc is next covered with a slip of diachylon plaster, and not removed for several hours.

On an Improved Preparation of Ointments (Deschamps).—Struck with the little alteration that takes place in the poplar ointment, and believing that its preservation was due to the resinous matter extracted by the lard from the poplar buds, M. Deschamps determined to try, a few years since, whether the portion of benzoin soluble in lard, possessed the same properties as the resinous matter of the poplar buds, and whether, while it yielded a pleasantly aromatised product, it would not prevent its decomposition. He, therefore, in accordance with these views, prepared two kinds of ointment, one with benzoin and the other with poplar buds. The first was made as follows:—120 grammes of coarsely powdered benzoin, 3,000 grammes of freshly-melted lard, heated in a water-bath for two or three hours, strained with expression, and stirred from time to time until cold. The poplar ointment was prepared with 500 grammes of poplar buds, 3,000 grammes of freshly-melted lard, and 250 grammes of water, heated together in a tinned bason, until there was no longer any moisture, then strained through linen, and stirred from time to time until cold. These benzoin and poplar ointments did not present any indications of change by the smell after the lapse of several years. M. Deschamps also subjected them to the action of several reagents, capable of demonstrating whether this state of preservation was real, and he ascertained that there did not exist any difference between them and the ordinary fatty bodies. Fats thus prepared are, therefore, much less changeable than those which are employed in the preparation of ointments; they effect its preservation, and, consequently, M. Deschamps proposes their employment in future instead of lard.

Bougies and Suppositories of Dr. Leclerc.—M. Leclerc has combined energetic medicines, such as opium, belladonna, chloruret of zinc, tannin, &c., with a mixture of sugar, gum, and gelatine, and has given to them the form of bougies, pessaries, plugs, &c. These bougies are flexible, supple, and completely soluble, and may advantageously replace injections in the treatment of mucous discharges from the genito-urinary

organs and the rectum. The dose of the active principle may be varied, as in an injection, at the wish of the medical attendant. Among the different plans proposed by M. Leclerc may be especially remarked the uterine bougie, which when introduced into the womb, dissolves there without pain, and replaces the intro-uterine injection, the use of which has been given up by the greater number of practitioners, for fear of the passage of the injected fluid into the cavity of the peritoneum by the Fallopian tubes; and the bougie for the cervix uteri, a small soluble funnel intended to enclose the cervix, and preserve it from contact with the mucus of the vaginal cul-de-sac, thus abridging, says M. Leclerc, the treatment of ulcerations of the neck of the womb.

Arsenical Paste of Frère Côme.—Arsenious acid is one of the best known caustics; it would certainly be preferred for cauterising cancers, if its absorption were not to be dreaded. By employing it with care, nevertheless, and limiting its action, it may yet be usefully applied. Several receipts for arsenical caustic pastes are published in the formulaire of M. Bouchardat; that of Frère Côme has lately attracted the attention of several surgeons. Frère Côme died without making known its composition: and M. Souberbielle, his relative and pupil, alone continued to make use of it with as much success as his master. M. Souberbielle communicated the formula to M. Manec, who applied the paste with very advantageous results. It is prepared in the following manner:—six grains of white arsenic, one gramme and ten grains of cinnabar, fourteen grains and a half of calcined sponge, powdered together. The proportion of arsenic is as from eleven to twelve to the hundred, and consequently stronger than in any known preparation, excepting that of Roussellot. When it is about to be used, the powder is mixed with a little water to the consistence of pap, and is then lightly spread over the ulcerated surfaces with a brush, care being taken to use only a small quantity, it being better to have recourse to repeated applications than to run the risk of considerable absorption. It is then covered with a piece of moistened agaric, which becomes detached at the end of ten, fifteen, twenty, or thirty days, sometimes later, and separates with the slough. After this separation has been effected, M. Souberbielle dresses the wound with the *yellow pommade of Frère Côme*, prepared as follows:—thirty-two grammes of yellow wax, forty-eight grammes of rose oil, seventy-five grammes of camphor, and one hundred and fifty grammes of Goulard's extract. This ointment is applied, spread upon linen, until the wound is cleansed of the whitish layer which covers it. If fungous excrescences should reappear afterwards, a renewed application of the paste is made, and repeated until the cancer is entirely destroyed. A very important remark is connected with the extent of the ulcer; if it exceeds three square centimetres, the treatment must be divided, in order not to risk absorption by too large a surface, and with that view not to cauterise a new portion until after the separation of the first slough. When the edges are callous, they must be stimulated by a blister, the caustic not acting except upon a moist and raw surface. M. Manec says he has ascertained by numerous experiments, that it is not necessary to remove the cancerous parts with a knife, before applying the arsenical paste, and that the diseased parts, whatever the thickness and depth of their roots may be, are specially and exclusively destroyed by the caustic, whilst the healthy parts are scarcely injured. M. Manec has also ascertained by experiments with Marsh's apparatus, that arsenic was absorbed in certain proportions, and that the urine yielded traces during a period varying from four to five days, according to whether absorption had been more or less rapid. The fæces have afforded traces of arsenic seven or eight days after the urine had ceased to yield any.

Cauterisations employed to prevent and cure Phlebitis and Purulent Infection (Bonnet).—M. Bonnet mentions five cases in which he employed cauterisation with the red hot iron to prevent and cure phlebitis, all of which terminated successfully. He also narrates two cases of purulent infection cured by cauterising the wounds with the red hot iron, or, what is better still, with the paste of the chloruret of zinc (see second edition of the "Formulaire," p. 321). The results are such as should attract the attention of surgeons.

Treatment of Malignant Pustule (Bourgeois).—The local treatment consists essentially in cauterisation. The caustic which M. Bourgeois prescribes is the potassa fusa. The general treatment consists almost exclusively in the exhibition of diffusible tonics, such as hot decoction of bark, vinous lemonade, and hot wine sugared, and aromatised with cinnamon. M. Bourgeois also prescribes the following aromatic potion:—Fifty grammes of cinnamon water, fifty grammes of mint water, fifty grammes of orange-flower water, ten grammes of spirit of mindererus, thirty grammes of elixir of Garus, and thirty grammes of syrup of bark. He also prescribes a lavement with two grammes of camphor.

Caustic Pommade (Baumès).—Eight grammes of lard, one gramme of powdered savine, one gramme of alum, one gramme of calomel. Used in frictions on vegetations. Under the influence of these frictions the greater number of vegetations, the most fungous and vascular especially, become inflamed, suppurate, shrink up, and come away by shreds.

Use of Sulphate of Copper in producing the Cicatrisation of Ulcers (Brunzlow).—The wound or ulcer, especially the edges, is to be lightly touched every day with the crystallised sulphate of copper, the surface that has been touched being afterwards dressed with lead ointment. The salt is also employed in solution as an injection into fistulous ulcerations.

Revulsive Caoutchouc (Kemmerer).—In strips of caoutchouc of the requisite length holes about the size of a pea are made with a blunt bradawl, more or less distant from each other, and in these holes are placed pieces of Vienna paste. When the strip is applied on the skin, it is allowed to remain for ten minutes or half an hour, according to the desired effect. The revulsive caoutchouc has a prompt and energetic action which may be limited at pleasure. M. Kemmerer prefers it to the use of croton oil in frictions, or to that of Autenrieth's pommade. But the Filhos caustic, which is easily used, may certainly advantageously replace the revulsive caoutchouc.

Balsam for Chilblains (Lejeune). — Five grammes of camphor, twenty grammes of tincture of benzoin, twenty grammes of ioduret of potassium, 160 grammes of brandy, forty grammes of the liquid acetate of lead, forty grammes of animal soap, ten grammes of essence of lemon. This very complicated preparation is not preferable to those that are more generally known.

Remarks on the treatment of Tinea.—The researches of M. Gruby, as to the nature of tinea, appear to open a new way for the treatment of this obstinate disease: in fact, if we admit, with M. Gruby, that genuine tinea is constituted by a special vegetation, it should be easy to discover a means to oppose efficaciously the development of this vegetation, for several agents are known which energetically destroy all plants without affecting the tissues of animals in an evident manner; nevertheless, two years have passed away since the publication of M. Gruby's researches, and yet no useful application has stamped them of practical value. Many skilful practitioners have applied themselves lately to the treatment of tinea; the most fortunate results in this respect have been obtained by M. Petel, of Louviers. In the *Annuaire* for 1842, his plan of treatment is described, as also that adopted by M. Ordinaire. This latter plan, the efficacy of which has been recognised, rather recals the ancient barbarous proceeding of *la calotte*, but it must be acknowledged that it is infinitely preferable, and much more in accordance with the spirit of the age. The outline of M. Petel's plan is founded on the treatment adopted by the brothers Mahon, which is now known to have for its base the use of alkalies, aided by excessive cleanliness. M. Oscar Figuier, a pharmacien chimiste, at Montpellier, has analysed the powder of the brothers Mahon, which had been sent to him by M. Moulinié, and has ascertained that it consists solely of vegetable ashes, without the addition of any foreign metallic substance. These ashes contain a small portion of carbonate of potash, on which their properties depend. M. Moulinié informs us that the ointment of the Mahon's is prepared by mixing these powders with lard.

It must be acknowledged that of all the plans of treatment employed against tinea, that of the Messrs. Mahon is certainly the most gentle and the most useful; it has for its object cleansing the surface of the scalp, happily modifying the diseased scalp, effecting without pain the fall of the hair, the follicles of which are inflamed, and it is followed by a perfect cure. The following is the plan of proceeding pursued by Messrs. Mahon, according to the account given by M. Rayer:—the Messrs. Mahon begin by cutting the hair to within five centimetres and a half of the scalp, in order to make the hair come away more readily with the comb: they then detach the crusts with lard or with linseed meal poultices, after which the head is washed with soap and water. These inunctions and lotions are repeated with great care for five days, or until the surface of the scalp is cleansed; the second part of the treatment is then commenced, its object being the slow and painless avulsion of the hair on every part of the scalp where tinea favosa is developed. Inunction with a depilatory ointment is made every second day, and is continued for a longer or shorter period, according as the disease is more or less severe. On the days when the ointment is not used, a fine comb is drawn through the hair, which comes away without pain. After this plan has been adopted for a fortnight, a few pinches of a depilatory powder are scattered among the hair once a week, the comb being passed through the hair on the diseased parts the next day, and a fresh inunction of the depilatory ointment made; this plan is pursued for a month or six weeks, when the first depilatory ointment is replaced by another, composed of lard and a more active powder, which is used in inunction daily on the diseased parts, in the dose of from ten to fifteen grammes for a fortnight or a month, according to the severity of the case. The inunctions are afterwards used only twice a week, until the redness of the skin has entirely disappeared. The patient is combed once or twice on those days when the ointment is not used, taking care not to press on the comb so much as to cause it to take up any of the ointment. M. Bouchardat adds that Messrs. Mahon practise with great dexterity, and that they can dress two or three hundred patients with tinea in a few hours.

If the information furnished by M. Moulinié, and the analysis made by M. Figuier are correct, it must be admitted that the powders used by the Messrs. Mahon consist solely of vegetable ashes, and that their ointment is a mixture of these ashes and of lard. It is extremely probable that their remedy is not a recent invention, and that it has been handed down in the family by tradition. M. Bouchardat advances this opinion, because, in examining the formulæ employed by Sydenham, he found one which is strongly recommended by that great physician for tinea, and which has considerable resemblance to the ointment of the Messrs. Mahon, as made known by Messrs. Moulinié and Figuier. It is as follows:—

Ointment against Tinea Capitis (Sydenham).—Thirty grammes of oil of almonds, thirty grammes of laurel oil, thirty grammes of the ashes of southernwood leaves, mixed carefully together, and made into a liniment, with which the head is to be carefully anointed every morning, and a pig's bladder worn afterwards. The treatment is to be commenced by a purgative. Why has this formula fallen into disuse? Doubtlessly because medical men would not subject their patients to the long and minute cares which this plan of treatment requires. The Messrs. Mahon always succeed, because they have exemplary patience, and long experience has taught them many useful modifications of detail.

Liniment against Burns (De Bourge)—Equal parts of liquid chloruret of lime and white oil, mixed carefully together. The dressings ought to be made with fine linen, or rather with court-plaster pierced with holes, and spread with this

mixture. A pledget of wadding, also spread with this preparation, is placed over the court-plaster. M. De Bourge has employed this preparation for fifteen years, with the greatest success.

Treatment of Inflammation and Abscess of the Breast, by Compression (De Sandouville).—M. De Sandouville thus resumes the treatment which M. Trousseau adopts in cases of inflammation and abscess of the breast. The application of large poultices and compression are the only means indicated before the formation of pus. When suppuration is discovered, the incision and compression ought to be had recourse to, except in those cases where the affection of the breast originates in a disease of the chest or of the thoracic parietes. Compression is effected by means of strips of adhesive plaster; they should be from three to four metres long, and about three centimetres wide. The patient being seated in bed, and the chest entirely uncovered, the surgeon places himself on the diseased side; he first fixes the free end of a slip of plaster about the middle of the back, then bringing it over the lateral part of the chest he passes it over the breast, beginning at its lower part, then ascending obliquely to reach the external third of the clavicle of the sound side, and afterwards descending on the back, so as to cover the first turn of the bandage. Care must be taken that each turn covers the two upper thirds of the preceding one. When one set of turns has covered nearly the entire extent of the breast, other bandages are placed, which, commencing from the upper and anterior part of the abdomen, below the non-affected breast, are carried upwards, and pass under the armpit, crossing the first set obliquely; they are then brought back, after having traversed the posterior part of the chest, to the place where they commenced. Other strips are applied in the same manner, care being taken, as before, to cover the two upper thirds of each of the preceding slips by its successor. Compression may and ought to be employed in the commencement as a discutient measure in any form of inflammation of the breast; if it does not prevent suppuration, it relieves the pain immediately.

On a means of arresting Nasal Hæmorrhage (Negrier).—This plan has already been made known in a preceding *Annuaire*. It consists in raising one or both arms at once, at the same time closing by lateral pressure the nostril or nostrils whence the blood issues. M. Negrier is convinced that lifting up the arms diminishes the ascending motion of the blood to the head. He has applied his plan of treatment to cases of intense headache, accompanied with stupor and cerebral congestion.

Moxas of Marmoral (M. Guépratte).—Their preparation is simple, their application convenient, and their action can be regulated at the will of the operator. A leaf of ungummed paper, soaked in subacetate of lead, and properly dried, is sufficient to prepare sixty cylinders, which will burn alone always parallel to their bases, and with sufficient slowness to develope gradually that heat, which ought to crack the epidermis and produce an eschar. There are neither sparks nor smoke to annoy the practitioner, nor to inconvenience the patient, and bring on the fits of coughing of phthisical patients, for instance. M. Guépratte generally substitutes new unbleached calico for the paper; he cuts slips about half as high again as the moxas; he folds, and rolls them round, securing the last fold with a few stitches. In this manner he has not a perfect cylinder, but a truncated cone, with a sufficiently large base not to require the use of any instrument to retain its position, which it can do itself if the skin be moistened. All that is requisite is to hold the patient steady.

Croton Oil Plaster: reflections on the use of Croton Oil.—Croton oil is an useful medicine, which has been definitely adopted in practice; it has not been of the ephemeral kind with those which are highly vaunted when they are first introduced, and are speedily abandoned. The purgative properties of croton oil have long been known in India; and Dr. Cromwell, a surgeon in the East India Company's service, made it known to the profession in England. It was introduced into France by M. Friedlander, who read some observations on it before the Academy on the 13th of January, 1824, and since that date it has been generally employed. This energetic purgative is frequently used to combat the obstinate constipation which often accompanies several affections of the nervous centres. Dr. Kinglake has given it with great success in colica pictonum; and his practice has been followed by M. Bally, recommended by M. Tanquerel, and highly lauded by M. Double; nevertheless, the old treatment of the *Frères de la Charité* for colica pictonum, as it succeeds very well, and has no inconvenient results, is generally preferred at the Hôtel Dieu. When the attack of colic is but slight, and yields to the exhibition of one or two drops of the oil, all goes well; but when it is requisite frequently to repeat the dose of this very energetic drastic purgative, it is not always done with impunity. Croton oil is a very powerful purgative, but it cannot be given every day without inconvenience, and for this reason, it ought not to be employed in the treatment of typhoid fever, by purgatives. It does not succeed when exhibited in the form of lavement. M. Bouchardat has seen large doses thus given, such as two, four, and even ten drops, and yet no evacuation produced. For example, in a case of poisoning by an injection containing a large dose of opium, an enema, containing ten drops of croton oil was exhibited, without causing an evacuation, and M. Bouchardat believes that better success would have attended their efforts, had an enema with fifteen grammes of senna and thirty grammes of the sulphate of soda been prescribed. Senna, in fact, causes energetic intestinal contractions, and, under the influence of a solution of the sulphate of soda, the liquids are poured out in abundance into the intestines. The choice of a purgative is a problem of as much difficulty as importance; as they produce their effects on the system by different physiological actions, it is very necessary in practice to be acquainted with, and to appreciate these effects. In a future *Annuaire* M. Bouchardat promises to resume this subject.

We now come to the use of croton oil externally. Ainslie recommended frictions with croton oil to remove rheumatic pains. It is generally supposed that the purgative action of croton oil is experienced when it is applied on the skin. To determine this point, M. Andral undertook a series of experiments, an account of which has been given by M. Joret in his thesis. In ten cases in which frictions were made on the abdomen with croton oil, mixed with almond oil, no purgative effect was produced. Of nine patients on whom the croton oil was used in frictions in a pure state, one only was purged, although twenty drops were used in the friction on several occasions. From these facts, M. Bouchardat observes, we may conclude that croton oil, used in frictions, does not act as a purgative, but it possesses the very valuable property of inducing a vesicular inflammation on the skin, which it is very important to produce in a great number of diseases. It is a very efficacious measure of revulsion, and causes but little pain. How should croton oil be prescribed to answer this purpose? It is generally ordered pure, or diluted with two or four times its weight of oil of sweet almonds. This plan of exhibition is inconvenient, for the crotonic acid, the active principle of the oil, is volatile, and is often dissipated without producing the required effect; it also causes inflammation on the skin of the fingers with which the friction has been made. To avoid these inconveniences, a plaster of croton oil has been recommended. M. Chomel has already made some experiments with respect to such a plaster. As there was not any formula for a croton oil plaster in existence, and M. Chomel was desirous of employing it in the Hôtel Dieu, M. Bouchardat proposed to incorporate in the emplastic mass a twentieth, a tenth, and a fifth part of croton oil. Experience proved that to obtain a plaster capable of causing a vesicular inflammation in twenty-four hours, it is requisite to employ a fifth part of croton oil. The following is the plan adopted by M. Bouchardat:—eighty grammes of gum diachylon plaster were melted at a very gentle fire, and when semi-liquid twenty grammes of croton oil were mixed with it. The emplastic mass which resulted from this mixture was spread in a thick layer upon a strip of calico: and thus was obtained a very adhesive *croton sparadrap*, capable of producing considerable irritation on the skin. It may be employed in all cases where revulsives are required. It does not cause such severe pain as many other counter-irritants; and it may be applied over an extensive surface, so that a derivative action may be established proportional to the irritation which is to be combatted,—an indispensable condition in the employment of these heroic remedies. M. Bouchardat is fully of opinion that the croton oil plaster will be found available in the treatment of many chronic diseases, both of the respiratory apparatus, and of the abdominal viscera.

M. Caventou states that, six years before the communication of M. Friedlander was made to the Academy, he, in conjunction with M. Pelletier, published a memoir on croton oil, in which they made known its chemical nature and physiological action. M. Caventou prefers to the croton oil plaster a rubefacient ointment, prepared as follows:—twenty-five grammes of lard, five grammes of wax, ten grammes of croton oil. The wax is melted in the lard at a gentle heat, then set aside to cool, scraped off in thin layers, and incorporated with the croton oil, when cold. This ointment, previously diluted, may be used to keep blisters discharging; it not possessing some of the inconveniences of cantharides.

Use of Ammoniacal Caustic in Amaurosis.—Cauterisation, by Gondret's pommade, in cases of amaurosis, is a means of treatment which is often efficacious. The following is a remarkable instance of cure. The patient was a man, twenty-eight years of age, affected with complete amaurosis for about a twelvemonth. M. Lisfranc treated him during two months with bleedings, repeated emetics, and very powerful and continuous derivatives on the alimentary canal, but without obtaining the slightest benefit. M. Lisfranc then had recourse to syncipital cauterisation by means of Gondret's pommade. This remedy was applied daily, for three consecutive months, to the anterior and superior part of the head; its application upon a raw wound caused sufferings which the patient bore with great courage; nevertheless, upon two or three occasions, the pain in the head became so severe, that a small bleeding from the foot was needed. The pain was removed in twenty-four hours, and the use of Gondret's ointment was then resumed. Three months' perseverance was ultimately rewarded, for in the early part of the fourth month the sight began to improve; the pommade was continued, and the improvement became daily more and more evident, and, ultimately, the cure was so successful that the patient was enabled to read the smallest type.

Use of the Ammoniacal Caustic in Lupus (Boinet).—The diseased surfaces are covered with this ointment every fifth or sixth day. A tonic regimen, and ferruginous preparations are had recourse to at the same time.

Veterinary Pharmacy: *Liquid against Pietin* (Analysis of Braconnot).—For a quart of this preparation, eight decilitres of water are used; in a part of which are dissolved sixty-eight grammes of powdered crystallised sulphate of copper. On the other hand, twelve grammes of sulphate of iron are calcined in a crucible to a red heat, then treated with a second part of the water, in order, afterwards, to separate by filtration, the insoluble part from that which is dissolved; the latter is added to the cuprous solution; twenty grammes of lime, previously extinct by water, and strained, are then diluted in a copper mortar with a little water, and the solutions of the sulphates of iron and copper are added to it, the mixture being continually stirred. One hundred and ninety grammes of common salt are next dissolved in it, and two centilitres of wood-vinegar of commerce, diluted with a sufficient quantity of water to make up a quart, are added. If there is not any wood-vinegar at hand, its place may be supplied by the ordinary white vinegar, in sufficient quantity that, when set aside, the supernatant liquid may have a slight greenish-yellow colour, the precaution being taken not sensibly to

redissolve the deposit. In using this preparation, the diseased surface is uncovered, the wound washed with very salt water, wiped, and then bathed with this preparation, previously shaken.

Kusic Powder (Habert). — One hundred grammes of nitrate of potash, one hundred grammes of sulphur, two grammes of charcoal; divided into packets, weighing two grammes each. This powder is employed to prevent and cure the disorder in dogs. Three packets are given daily for three days.

Liquid against Pietin (Duvillé).—Five hundred grammes of aloes, dissolved in one kilogramme of alcohol, at 50°, to which is added 600 grammes of sulphuric acid. It is employed as a caustic.

Another Preparation against Pictin (Leloup). —Eight hundred and seventy-five grammes of honey, 440 grammes of acetic acid (wood-vinegar), 310 grammes of powdered verdigris. These substances are mixed together, and boiled in a large copper bason, until the mixture has acquired a reddish-purple colour, and the consistence of thin honey; 875 grammes of Venice turpentine are then added to the mixture, while over a very gentle fire, and the compound stirred for a quarter of an hour with a wood spatula, to render it homogeneous; it is then run, while hot, into pots. In using it, the ergot of sheep is cleansed with an iron blade, and then one or two applications are made to the fissures with a wooden spatula, at twelve hours interval. M. Leloup has had this preparation tried by ten shepherds at least, on sheep affected with pietin. Twenty-four hours after the application they were cured. This remedy adheres perfectly to the fissured parts of the animal's feet, and cannot be removed by water, so that a speedy result follows its use. M. Leloup calls it the *terebinthinate oxymellite of copper.*

Liquor for Preserving Animals (Gannal).— One kilogramme of the simple sulphate of alum, 100 grammes of nux vomica, in powder, and three quarts of water are boiled together until only a quart and a half of liquid is left. When the mixture is cold it must be poured off clear. This liquid serves for injections, which, in birds, are made into the larynx, and for all the mammiferæ, even to rats, by the carotid artery. Smaller ones a re injected by the base of the heart. Those animals, whose flesh it is desired to preserve, should be injected with a solution of two grammes of the chloruret of aluminium in ten quarts of water. The residue of the filtered liquid may also be employed: the yolk of one egg, beaten up with three teaspoonsful of the residue, forms a paste, which, when freshly prepared, serves to smear over the inner surface of skins, and especially the fleshy parts. Another question refers to the preservation of feathers, and in this M. Gannal succeeds by three different plans. He employs powdered nux vomica with an alcoholic tincture, prepared with 100 grammes of powdered nux vomica, macerated in a quart of alcohol. The skin is rubbed over with the tincture of nux vomica, by means of a brush, or if the bird has a white plumage, a solution of strychnine is employed: finally, the feathers may be dusted with powdered nux vomica.

Toxicology: *Poisoning by Aconitum Napellus* (Francis Devay). — The last number of the *Journal de Medecine*, of Lyons, contains a remarkable instance of poisoning by aconite. On the 26th of October, 1843, about half-past eight in the evening, a man named Grimaud, thirty-five years of age, who was employed in one of the pharmacies of Lyons, swallowed, by mistake, at his supper, about forty grammes of the alcoholature of aconite, prepared with equal parts of the fresh plant and of alcohol, and which he had himself placed in the morning in a black glass bottle, by the side of that which contained the wine he was accustomed to drink at his meals. He immediately experienced a sensation of heat and constriction of the throat, and thus discovered the mistake he had made. He applied at once to one of the pupils of the establishment, who gave him a grain of tartar-emetic, dissolved in a large quantity of water. Vomiting, however, was not induced. A short time after, M. F. Devay saw the patient; his anxiety was such that he could not remain at rest, his legs were constantly moving, even for the short time when he was sitting down. When he got up his legs gave way, and his walk was vacillating; the intellectual faculties were clear, and the senses were not disordered in their functions; the tongue was whitish, and there was slight nausea, but no colic. M. Devay ordered three grains of tartar-emetic, and twenty grains of powdered ipecacuanha, in 125 grammes of water. In about seven or eight minutes free and repeated vomiting took place. At eleven at night the patient could no longer stand; he was affected with convulsive movements, characterised as follows: the upper and lower limbs were retracted inwards; the fingers were strongly flexed into the palm of the hand, and concealed the thumb; it was impossible to open them; and the feet were in a permanent state of adduction. There were not any shocks. The face was covered with a cold and viscid sweat; the eyes were turned upwards, and the whites only could be seen. The temporal and radial arteries had ceased to beat. This state continued for about three minutes, and then the relaxation of the spasm occurred. The patient then expressed the agony which he suffered, and said that he felt his last hour was approaching. The intellectual faculties were clear, but the man was perfectly blind; he could not distinguish either the persons or the objects which were around him; slight vomitings, and constant nausea, followed by crises such as just described, marked this period. At half-past twelve the same state continued; excessive anguish; intermission of the crises, and nausea. A mixture was ordered for him, containing three grains of tartar-emetic, twelve grammes of sulphate of soda, and 150 grammes of water. Repeated and abundant vomitings ensued, lasting for a quarter of an hour, but without relief. A lavement, prepared with sixteen grammes of the sulphate of soda, and turbid antimonial wine was given, and he had also vinegaretted water, in small quantities. The sight was restored by one o'clock, but the crises became more frightful than ever; the temperature of the skin was also rapidly diminishing. The patient experienced some shiverings, and he was soon seized with an icy coldness. Next followed facies hippocratica; the head was forcibly thrown backwards; cracking of the joints was heard during the momentary cessation of the contracture; and the breathing became stertorous, with some appearance of mucous râle. The patient, in spite of the horrors of his condition, perfectly understood all that was said to him; he did not complain of any pain in the abdomen. From the commencement of the crises, the fore arms and wrists became so insensible, that he did not feel the pricking of pins, even when pushed in rather deeply. M. Devay employed vinegaretted sinapisms all over the body, excepting over the abdomen, which still possessed the natural animal heat, and administered internally ioduretted water, the use of which has been recommended by M. Bouchardat (six grains of ioduret of potassium, two grains of iodine, 250 grammes of distilled water). Reaction commenced at three in the morning; the pulsations of the heart could be again felt; the pulse began to rise; some degree of vomiting continued; but the patient felt that he was better. M. Devay prescribed a strengthening mixture with infusion of mint and balm, and with eight grammes of the spirit of mindererus. A hot iron was also passed over the body and limbs. At four, the countenance was improved; he was covered with an abundant warm sweat; the pulse was 125; sensation was entirely restored to the wrists; and the patient breathed freely. Nitrous ptisan of dandelion, syrup of the five roots. At six, the patient had slept for half an hour, and on waking complained of feeling altogether upset; diaphoresis. A purgative enema was administered, which brought away fœcal matter, of a blackish colour, and very fœtid. There was very little urine secreted, and that of a very deep colour; the abdomen was free from pain and soft; the tongue was moist and whitish. The two following days passed without any new symptoms; the sleep only was rather disturbed. On the third day he had a good appetite, and could leave his room, presenting only a sort of half-stupidity, and not having at any period of the poisoning exhibited that kind of mental alienation described by toxicologists as attending poisoning by the aconitum napellus. M. Bouchardat observes there are three things worthy of note in this case: 1st, that the alcoholate of aconite, which produced the poisoning, must consequently be a very active pharmaceutical preparation of aconite; 2nd, the symptoms described were exceedingly severe, and appeared to threaten a fatal termination; and, thirdly, the energetic treatment that was adopted was as correct as it was rational.

Poisoning by Absorption of Corrosive Sublimate.—The number for December of the *Bulletin de Therapeutique* contains a remarkable case of poisoning by corrosive sublimate. A child, two years old, enjoying good health, was troubled with excoriations on the upper part of the thighs. His mother was in the habit of washing and dusting them with lycopodium; but unfortunately, by mistake, one day she used an impure corrosive sublimate, which presented some features of resemblance with the powdered lycopodium. She used this to dust the bend of the right groin, the internal surface of the scrotum, and the upper part of the right thigh. The child struggled and cried. In twenty minutes a brown eschar formed in the bend of the groin, about four centimetres square, and the scrotum became very much swollen, and, as it were, semi-transparent. Dr. Bouchut gave the child three emollient baths, for an hour each, in the first twelve hours, in order to soothe the sufferings of the child, and to assist the solution of the molecules of corrosive sublimate, the combination of which had not taken place. The case appearing very serious, the little patient was taken to the hospital for children, where it was placed under the care of M. Trousseau, thirty-six hours after the accident. The local state did not appear to give rise to much alarm, but towards the evening of the second day after the application of the sublimate, the gums became painful, red, and swollen, and were covered with a whitish layer, as was also the tongue; the breath became fœtid, and the sub-maxillary glands painful; the entire mucous membrane of the mouth was soon affected with the same disorder, and, by the sixth day, the swelling had extended to the membrane of the velum palati, and the inside of the cheeks. Greyish eschars formed, one upon the under lip, and others on each side of the alveoli of the upper jaw, on a level with the molar teeth, and others also on the sides of the tongue. Below the whitish layers of slough, the membrane was fungous and bleeding. Sphacelus of the gums followed, the edge of the maxillary bones was exposed, and several of the lower incisor teeth fell out. The breath became excessively fœtid, but salivation was apparently very slight; it was difficult to ascertain its existence in the child, as it continually swallowed the saliva. M. Trousseau in the first instance cauterised the mucous membrane with powdered alum, and afterwards with diluted hydrochloric acid; he next applied a brush, charged with nitric acid, to the slough, but not one of these applications was able to arrest the progress of the mischief. Considerable hæmorrhage took place on several occasions, from the ulcerated surfaces, or from the sloughs. Part of the blood was swallowed, the other part spit out with some shreds of the sphacelated mucous membrane. The poor child ultimately died on the fifteenth day after the accident.

M. Mialhe, in a communication which he made to the *Societe de Pharmacie*, thus states the plan of treatment which he would have adopted, had the child been under his care:—1st, the slough containing the corrosive sublimate should have been removed, if possible; 2nd, the parts would have been washed with salt water, to dissolve and remove the sublimate combined with albumen and fibrine; and 3rd, local applications of the hydrated sulphuret of iron would have been made to form an insoluble combination with that portion of the mercurial salt which had not been removed.

Lithontriptics: *Report of Messrs. Gay Lussac, and Pellouze, on the Solution of Urinary Concretions.*—If we go back to the time when the

chemical constitution of calculi was unknown, we shall find that the number of the remedies described as lithontriptics, borrowed indiscriminately from the three kingdoms of nature, was infinite, the very multitude of panaceas clearly shewing the absence of any real solvent for the stone; for if there had been one whose efficacy was fully demonstrated, it would have been handed down to us as have been all the other remedies which have the sanction of experience. The most celebrated of these remedies was that of Mrs. Stephens, of which, egg-shells and soap were the principal ingredients. It was received with a species of enthusiasm in England, and its reputation spread rapidly in France. The Academy of Sciences directed Moraud to ascertain the value of this solvent, for the discovery of which a large reward had been granted to the author by the English Parliament. The report of this celebrated surgeon, published in the memoirs of the Academy, for 1740, and 1741, was not as favourable as that of the English physicians; there were but few examples of cure among a great many instances of failure. The number of these cures even became more and more rare; the symptoms of stone reappeared with those who had thought themselves cured; and in others, as, for example, in the English minister, Walpole, calculi were found in the bladder after death. The remedy of Mrs. Stephens, therefore, so highly vaunted when first made known, gradually fell into oblivion, and the attempt at a very doubtful solution of the calculus was again succeeded by the more certain operation of lithotomy. At this period, the true nature of urinary concretions was unknown, and, consequently, a rational treatment for the stone was impossible. At a later period, Scheele, Bergmann, Fourcroy, Vauquelin, Wollaston, and Marcet, ascertained the chemical composition of calculi in the bladder; their labours re-excited hope; and, placing them on a truly scientific basis, some chemists were led to propose new agents for the solution of calculi. Fourcroy and Vauquelin devoted considerable time to this important subject. Witnesses of the extreme slowness with which reagents acted in the state in which alone it was possible to employ them, that is in solution with a very large quantity of water, they were led by experience to conclude that the introduction of reagents into the human body, in the form of drinks, was insufficient, and that it was requisite to bring them into immediate contact with the calculus, by injections into the bladder. They also proposed modifying the nature of the lithontriptic solvents according to the composition of the calculus: thus, for the phosphates and oxalates, instead of the alkalies or alkaline salts, which are especially destined to dissolve uric acid, they preferred the employment of nitric, or hydrochloric acid. Their curative measures then presupposed a knowledge of the nature of the stone, since they were to vary according to its composition. To obtain this information, they proposed throwing in injections, and to examine chemically the urine of the patients, and the liquids which had served for the exploration of the calculus. But in order to apply with success these extremely delicate measures of exploration and cure to calculi, the aid of surgery was required, and the surgeons in practice in those days, doubtlessly not sharing the hopes of these two celebrated chemists, did not attempt any experiments on the living body.

Some years ago, when lithotrity began to be rather a frequent operation, several physicians and chemists published new observations on the efficacy of alcaline mineral waters, not only in cases of gravel, in which it was generally admitted, but also against real calculi, which, either disintegrated or dissolved, said they, by the use of these waters, were afterwards expelled naturally from the bladder with the urine. The assertion was not new, it is true, but it bore a character of greater certainty, as it rested on new discoveries in science, relative to the chemical nature of these mineral waters, and that of the calculi. It was asserted that the mucus which serves in some sort as a cement to the calculus, softened by the action of the alkaline carbonates, permitted the solution or rapid disintegration of the concretions in the bladder, especially when they were composed of uric acid. It was also believed that the alkaline drinks possessed the power of preventing the formation of new calculi; and they were, consequently, administered more freely to the patient than formerly. It must, however, be acknowledged that very few cases were cited of solution of a real calculus, that is to say of a calculus of any size. Most frequently neither the presence nor the size of the stone had been ascertained, and even when the exploration had been made before the treatment was commenced, the patient, when relieved or cured, refused to allow himself to be sounded again.

We shall not speak of the cures of more or less date, of which we were not witnesses, having thought it more advisable to seek for the elements of our judgment in experiments or observations made by ourselves or else in our presence. These experiments are of two kinds; the one set have been made in the laboratory, and the others on patients. For two years we have not interrupted our endeavours to obtain the solution of calculi, and during that long lapse of time we have collected from the patients themselves on whom we have experimented, considerable information, which must necessarily be taken into account with respect to the important question of the solution of calculi.

The most frequently employed lithontriptic solvents, those in which practitioners have most confidence, are the alkaline bicarbonates. Experiments made in the laboratory have taught us that in the greater number of cases the action of these salts is exerted rather on the mucus, or animal matters which serve to cement together the particles of the calculi, than on the calculi themselves, even when they are composed of uric acid. The degree of hardness and cohesion of the stone, rather than its chemical composition therefore, oppose an obstacle to its disintegration or solution. The alkaline carbonates attack the calculi of uric acid with exceeding slowness, even when the solution is concentrated, and at a temperature of 104 deg., Fahr. When they are decarbonated, the solution of the stone takes place much more rapidly, even when the alkaline liquid is comparatively much weaker. This remark is not new; Scheele had previously pointed out the great difficulty of decomposing the alkaline carbonates by uric acid. Experiments made at one of the Vichy springs on the solution of a great number of fragments of calculi have presented similar results, and, with a few exceptions, the solution has taken place in the same manner for calculi of the most different composition. Our results in this respect are evidently the same as those obtained a few years since by M. Petit, who published them in his work entitled, *Sur les Traitement Medical des Calculs Urinaires.*

A box pierced throughout with holes, and divided into a great number of compartments, was placed for ten months in one of the Vichy springs; it contained a number of fragments of calculi. All these fragments were diminished in weight, often to a considerable extent, but none were completely dissolved or disintegrated; all were much larger than the diameter of the canal of the urethra, although not one of them weighed more than ten grammes before the experiment. We shall not enlarge further on these attempts at solution of calculi in the Vichy waters, because we do not consider them of sufficient importance. We shall only observe that the process of the solution, although very slow in these waters, is much more marked, than in the solutions of the alkaline carbonates or bicarbonates; this appears to us to depend on the free disengagement of carbonic acid gas from the thermal waters of Vichy, and which acts mechanically on the calculi, and tends, consequently, to hasten their solution or division.

Experiments on direct solution, by reagents in the laboratory, could only prove of interest by their number. We have for an entire year kept numerous urinary calculi, differing in their composition from each other, in contact with solutions of the carbonates and bicarbonates of potash and soda, containing from ten to twenty grammes of the salt to the quart of water. The temperature of these liquids was most commonly the same as that of the laboratory, but it was sometimes raised to 97 and 104 degrees Fahr. Not one of these calculi was dissolved; and some appeared to have retained their primitive size. The loss in weight has varied from one-fourth to one-half. Some fragments of calculi weighing from five to ten grammes each, placed at the bottom of a glass funnel, have been washed for three consecutive months with about 500 quarts of water, containing a twentieth part of its weight of carbonate of soda. The size of the greater part of these fragments was not sensibly diminished, but they were all rendered more friable. The loss of weight they had experienced varied from 10-100ths to 60-100ths. Very small fragments, weighing from four grains to a gramme, generally resist for more than a month the action of water saturated with carbonate of soda, and raised to the temperature of from 86 to 104 degrees, Fahr. The resistance of the greater number of vesical calculi to their solution is such, that fragments of calculi of the size of a nut are not disintegrated or dissolved until after several days boiling in water containing sixty grammes of the bicarbonate of soda to the quart.

We have substituted for the alkaline carbonates the borates of soda and potash on the one hand, and, on the other, the nitric and hydrochloric acids; the same difficulties have occurred as regarded the solution of the calculi, only they have appeared to be rather less with borax.

These experiments shew how long and difficult a task it is to produce the solution of calculi, even when they are operated on out of the body. Even if we yield, as far as possible, to those who argue in favour of solvents, if we admit that the solution will not be more difficult in the bladder than in an inert vessel, and that all tendency to the production or increase of calculi, ceases under the influence of an alkaline regimen, there are still, it is evident, many difficulties to overcome before the solution can be effected.

The second serics of experiments, of which we are now about to speak, have been made upon patients, and consequently they have a much more direct influence. The greater part of these patients, before undergoing the operation of lithotrity, have tried for a longer or shorter period, sometimes even for several years, the solvent action of alkaline mineral waters, or that of the bicarbonates of potash and soda. We are not desirous to contest the fortunate results that may be obtained from the therapeutic employment of alkaline waters, and we are equally unwilling to deny all the cases of solution brought forwards by different medical men, but it appears to us beyond a doubt that the exhibition of alkaline remedies very frequently does not produce the solution of vesical calculi, and we believe that those persons are deceived who have asserted that large calculi have been dissolved in a few weeks, or even months, under the influence of an alkaline regimen. M. Leroy is not only of opinion that the treatment by alkaline drinks and baths is generally insufficient, but he also thinks he cannot force the kidneys to secrete an alkaline urine for years with impunity. In that point he agrees with several physicians, and, among others, with M. Prunelle, the inspector of the waters at Vichy. This physician has found such inconveniences from the use of these waters in large quantities, that he does not hesitate to declare that there is less danger and pain incurred from the operation of lithotrity. This question, however, will not be investigated, as it is altogether foreign to the present inquiry; those points only will be examined which have a direct bearing on the chemical history of the inquiry. M. Leroy further objects to the alkaline treatment in large doses, or rather he renews a very important objection, previously made by Marcet and by Proust, that the carthy phosphates, previously held in solution in the urine, by means of the free acids it contains, must be precipitated by their neutralisation, and thus give rise to the formation of calculi of the phosphate and carbonate of lime and magnesia. These cases have occurred, according to the author, in persons affected with vesical catarrh, in whom the urine was decomposed, and retained in the bladder

by some obstacle to its passage. He has not observed them under other circumstances, and, according to him, the phosphatic diathesis, which is then manifested, is a consequence of the inflammatory state of the bladder. Dr. Marcet, in his work on calculous disorders, mentions the case of a patient in whose bladder a calculus was detected by the sound; the patient having taken the carbonates for many years, the calculus, which was composed of uric acid, gradually disintegrated without being dissolved; he then passed phosphatic gravel from time to time, and when he died, part of an uric acid calculus was found in the bladder, together with several small concretions of the earthy phosphates.

The changes which take place spontaneously in the nature of the calculous secretion may, perhaps, be owing to a similar cause; under the influence of the urine, become ammoniacal as a consequence of the inflammatory condition of the bladder, the diathesis of the disease is changed, and the concretions, formerly uric, become phosphatic; thence arise the great number of *alternate calculi*, which, according to Dr. Proust, form more than one-fourth of the ordinary concretions. However that may be, it is certain that several of M. Leroy's patients, after having undergone the operation of lithotrity, and having been freed from uric acid calculi, having had recourse to a strongly alkaline regimen, in the hope of preventing the formation of fresh concretions, have been again attacked with a calculous disorder, during which calculi have been developed, formed principally of the earthy phosphates. In several of these the calculi have been composed of three, four, or five layers of uric and phosphatic deposit alternately. A patient, from whose bladder M. Leroy had extracted a large uric acid calculus, placed himself, a year after the operation, on a strongly-alkaline regimen, which he was advised to adopt to relieve a severe irritation of the bladder. At the end of four months he was sounded by M. Leroy, who found a very large calculus, which was very friable, on account, no doubt, of the rapidity with which it was formed. It consisted of phosphates of lime and magnesia, mixed with a small portion of uric acid and carbonate of lime.

These facts are of exceeding importance, and should direct the attention of medical men to the therapeutic action of alkaline waters. Examined in the point of view of chemical theory, they find a ready and natural explanation in the composition of the urine.

We shall terminate what we have to say of the properties of alkaline drinks, by mentioning a fact which has been pointed out by several physicians, and especially by Dr. Prunelle. There are some patients who, immediately after having commenced a regimen of alkaline waters, pass a very considerable quantity of uric acid gravel. Some will pass so large a quantity that, according to M. Prunelle, if we believe it all formed in the kidney, it must have a larger capacity than the stomach. We do not look upon it as impossible that the use of alkaline waters may in some persons cause an abnormal secretion of a considerable quantity of uric acid; and, if the fact we have just mentioned be correct, it is not without example in chemistry. It is well known that in a great many circumstances the presence of an alkali causes the formation of acids.

We should certainly not draw from the observations that have just been detailed the conclusion, that alkaline mineral waters should not be employed in the treatment of gravel or of stone. We shall only repeat, with Dr. Marcet and the celebrated Dr. Proust, supporting our opinions on several new facts observed by M. Leroy d'Etiolles, that it appears very certain that alkaline drinks may, under some circumstances, cause calculous deposits in the bladder. We may add besides, but merely as a simple hypothesis, that the alternating calculi are probably the product of a secretion alternately acid and alkaline. Finally, we do not regard it as impossible that a strongly alkaline regimen may produce an abnormal secretion of uric acid.

We have stated that the direct action of reagents on calculi in inert vessels only took place with exceeding slowness, and we have deemed ourselves justified in concluding from our experiments, that the solution of calculi in the bladder of a living man would be yet more difficult. We have consequently not made any experiments on entire calculi, but have preferred acting on fragments designedly left in the bladder after an incomplete operation for lithotrity, and we expected, even in this latter case, to meet with considerable difficulties. We preferred having recourse to injections and irrigations into the bladder to the slow proceeding of absorption, because, on the one hand, nothing could impede the chemical action; and, on the other, the stone could be brought into contact with more considerable quantities of the reagents. The substances which we used were the alkaline carbonates and bicarbonates, the caustic alkalies and hydrochloric and nitric acids. We made solutions of these different substances in distilled water, and employed them in irrigations at a temperature of 97° to 104° Fahrenheit. By means of a sound with a double canula, we introduced from twenty-five to 250 quarts of liquid into the bladder of the same patients. Some did not experience any pain or fatigue; but in others, and those the greater number, the bladder became irritable, and we were obliged to give up irrigating: once only did we see the fragments of calculus disappear and become dissolved in water, containing from four to five-hundredths of its weight of nitric acid. These fragments were formed of the phosphate of lime and of the ammoniaco-magnesian phosphate, mixed with a small quantity of uric acid. We have in several instances noticed a considerable diminution in the degree of cohesion of the calculi.

In one patient, whose bladder was sound, and but slightly irritable, we employed strong irrigations of an alkaline water, containing fifteen grammes of bicarbonate of soda to the quart of water. We knew that the fragments of calculus were composed of uric acid; their nature and diameter were ascertained. Two hundred and fifty quarts of water, holding in solution three kilogrammes and 750 grammes of bicarbonate of soda were thrown into the bladder of this patient; in spite of the enormous quantity of fluid which had thus washed, as it were, these fragments, their size was not sensibly diminished; instead, however, of the exceeding hardness which they presented before the experiment, they had become so friable, that a very slight pressure of the instrument was sufficient to break them in the bladder. In the greater number of the other experiments which were tried, the patients either could not continue the irrigations, or else they did not produce any result. The fragments of calculus did not appear to have undergone the slightest action from the reagents, and did not lose any portion of their hardness or size. The liquids which had been employed in the irrigations, were carefully examined, and found to contain only insignificant portions of the elements of the calculi. The composition of the latter, which was carefully ascertained, directed us as to the best solvents to employ.

So that, in fine, we have been but little satisfied with our experiments at solution by means of irrigation; borax, which was lately very much recommended as a more energetic solvent than the alkaline carbonates, has not afforded more decisive results than those salts; and we may make the same remark of the other reagents which have been already mentioned.

When so great difficulties present themselves with fragments of calculi of a few millimetres in diameter, we may indeed ask ourselves if we have reason to hope for the solution of these calculi when they are entire, compact, and voluminous, as is often the case. Some time since it was announced in England, that benzoic acid taken internally in a dose of several scruples, combined with a weak solution of borax and of an alkaline carbonate, was decomposed into hippuric acid, which was found in the urine. We were curious to verify the correctness of this assertion, but have only arrived at negative results. We have not discovered even the smallest quantity of hippuric acid in the urine, but have several times noticed that it presented an agreeable alcoholic odour, which could not be mistaken by any one for that which ordinarily characterises this secretion. The urine has also the peculiar character of keeping for several days without any apparent change.

Lithontriptic Action of the Gastric Juice (Millot, Leroy d'Etiolles).—M. Millot has stated that the gastric juice, even when diluted with an equal portion of distilled water, possesses the property of disintegrating vesical calculi, so as to render them capable of being crushed by the slightest effort or pressure of the finger, by effecting the solution of the cement of organic matter which unites the layers of the calculus. M. Leroy d'Etiolles observes, that a similar idea was put forth by Sennebier in his translation of Spallanzani's work, when treating of digestion; he has ascertained that this liquid has no action on the calculi of oxalate of lime, scarcely any on those of uric acid, and very slight on those of phosphate of lime, magnesia, and ammonia. He has not observed any effects worthy of notice except upon the alternating calculi.

These effects are thus explained by M. Bouchardat:—The organic matter which cements the calculi of oxalate of lime and uric acid, is generally mucus which is not modified by gastric juice. The alternating calculi, on the contrary, having almost all been deposited in a diseased bladder, an albuminous substance is combined with the mucus, and this is attacked by the gastric juice, so that the layers of the alternating calculi separate with facility. Setting aside, therefore, the great difficulty that would be experienced in obtaining sufficient quantities of gastric juice, the effects to be expected from it are limited and equivocal. But M. Bouchardat adds, he is convinced that the question of lithontriptics, although at present but little advanced, is yet capable of a fortunate solution, and he hopes in a future Annuaire to return to this subject.

SELECTIONS FROM GERMAN JOURNALS

By Sigismund Sutro, M.D.

REPORT ON THE LATEST DISCOVERIES AND IMPROVEMENTS IN TOXICOLOGY.

Arsenic.—Five individuals were lately poisoned by *arsenic*, contained in some well-water near Vienna. A large quantity of cobalt ore had been lying in a yard in which the well stood, and partly by exposure to air, partly by rain-water, the ore was decomposed, and yielded its arsenic to the well-water. The patients complained of an inclination to vomit, acute pains in the stomach and bowels, burning sensation in the throat, slight fever, thirst, exhaustion, &c. After the use of almond-milk, hot fomentations, and cataplasms, acetate of morphia, and repeated doses of the hydrated peroxide of iron, they soon recovered.

Antidotes for Arsenious Acid.—Before Bunsen's discovery, lime-water, hydrosulphuric acid, &c., were used. It has since been shown that—1, a very great quantity of hydrated oxide of iron is necessary for the neutralization of arsenious acid. 2. This combination is innocuous, and easily dissolved by the acid of the gastric juice. 3. That the *crocus martis aperitivus* (dry hydrated oxide of iron) may be substituted for the jelly-like hydrate. The following experiments were made by Sandras, to determine which are the most efficacious antidotes:—1. A small but healthy dog received, in a piece of meat, three grains of powdered arsenious acid; the œsophagus was tied with a ligature, so as to prevent vomiting: death took place during the night. Some submucous ecchymoses were found in the stomach. The spleen and the liver presented considerable traces of arsenic; the blood but little altered. 2. A large, healthy dog received the same quantity of arsenic, and immediately after 350 grains of the hydrated oxide of iron were injected into the stomach. No symptoms of poisoning appeared. 3. A large, lean, strong dog received, in some meat, three grains of arsenious acid, and afterwards a quantity of the *croxus martis aperitivus*, dissolved in water, was injected into the stomach. The œsophagus was tied with

a ligature; no symptoms of poisoning appeared, but the dog succumbed from the consequences of the operation. 4. A healthy hunting dog swallowed three grains of arsenic in meat, and immediately after 560 grains of the dry hydrated oxide of iron were dissolved in 1,260 grains of water, and injected into the stomach, and then a ligature was applied to the œsophagus. The dog died on the fifth day, with symptoms of purulent phlebitis, without any phenomena of poisoning by arsenic. 5. Another strong hunting dog received the same quantity of arsenious acid in meat, and then two table-spoonfuls of moist sulphuret of iron, likewise mixed with food. The œsophagus was tied with a ligature. Strong inclination to vomit manifested itself, with much white foam. After four hours these symptoms disappeared, and the dog remains well. 6. The same experiment, once more repeated, showed no symptoms of poisoning; but the dog died, on the 6th day, through hæmorrhage. 7. In another dog, where the sulphuret of iron was not given till forty minutes after symptoms of poisoning appeared, the animal died in twenty-two hours. From these experiments it was concluded, that hydrated oxide of iron and moist sulphuret of iron are the best antidotes for arsenious acid. Sulphuret of iron is perhaps preferable, inasmuch as it may be given, even where the nature of the poison is not determined; for, besides arsenious acid, it also decomposes corrosive sublimate (bichloride of mercury), salts of copper and of lead. As to the form in which the antidote is to be administered, that of jelly is the best. It is considered useful to give a few glasses of warm water soon afterwards, and to tickle the throat in order to promote vomiting. To one grain of arsenious acid, 120 grains of moist hydrated oxide of iron and 80 of the dry *crocus martis* are necessary.

To Discover Arsenic.—The following method is employed by Duflos and Hirsch :—If no poison is to be found in substance, and sulphuretted hydrogen cannot be directed on the mass, solid pieces of the organ are to be cut, and then digested with muriatic acid in a tubulated retort. After the tube has been well closed, the mass is to be distilled in a bath of chloride of calcium, till the contents of the retort begin to thicken. The portion that has passed over into the receiver is then to be taken away, and on the residue left in the retort rectified alcohol is to be poured, and then filtered. The alcohol is then to be distilled off, and the residue mixed with that previously taken from the receiver. Sulphuretted hydrogen is then passed into the liquid, which is then to be left quiet for some time, till the disappearance of the smell of hydrosulphuric acid, and then filtered. The sulphuret of arsenic remaining on the filtering paper is then to be acted on by warm ammonia, evaporated, mixed with nitric acid, and finally dried in a sand bath. The residue is mixed with six times its weight of subcarbonate of potass, and reduced in a proper apparatus by pure hydrogen gas: the metallic arsenic will be sublimed in the cold part of the glass tube.

To Discover Arsenic in the Secretions.—A series of experiments were instituted by Meurer on a young horse three years of age, to which, for seven consecutive days, a bolus was administered containing fifteen grains of arsenious acid. The urine evacuated six hours after the first dose, and that evacuated fifteen hours after, gave no trace of arsenic. It was not till thirty-six hours after the first dose (six hours after the second one) that a trace of arsenic could be found on the evaporation of eighteen ounces of urine. A little more was found in the excrements on the second day. After continuing the poison for seven days, no more than two or three spots of arsenic, of a metallic brilliancy, could be obtained from the urine and excrements. After the administration of the arsenic ceased, distinct traces of the poison could be discovered in the excrements, but none in the urine. Meurer employs the following method to reduce the organic substances which are to be subjected to analysis:—1. To reduce the uncoagulable organic liquids, he uses chlorate of potash with muriatic acid. 2. In solid substances, as the fæces, the soluble parts are best extracted by caustic potash, and then chlorine is to be passed through the liquid, or they are to be acted on by boiling nitric acid. 3. If the arsenic is entirely combined with the organic mass, as the brain, the liver, &c., the mass is to be incinerated by nitric acid.

To distinguish arseniuretted from antimoniuretted hydrogen, Meissner exhibited some experiments, the results of which are—Arseniuretted hydrogen passed through an alcoholic solution of potash, soda, or ammonia, produces no change; whilst the antimoniuretted hydrogen soon darkens the solution, and throws down black flakes.—*Takresbericht über die Fortschrette der Gesammten Medicin.*

ON THE ANHYDROUS SULPHITE OF AMMONIA.

We know that a new and remarkable acid was discovered some time since by Lanslois. It consists of three atoms of sulphur, combined with five atoms of oxygen. It is formed by digesting a solution of bisulphite of potash with sulphur, under moderate heat. Besides sulphate of potash, we have formed a combination of potash with the new acid; but we have no explanation of the part the sulphur takes in the chemical action, for the constituents of the bisulphite of potash alone are sufficient to form the above-mentioned products, thus:—$2K\,S^2 = K\,S + K\,S^3\,O^5$. The new acid, in an isolated state, or rather in solution, is found a little more fixed than hyposulphurous acid, but, in many cases, it is also decomposed into sulphur and hyposulphurous acid. Hyposulphurous acid cannot exist as a solution in water, but is immediately decomposed into sulphuric acid, hyposulphurous acid, and sulphur. The anhydrous bisulphite of ammonia, if treated with water, undergoes changes similar to those of the bisulphite of potash. The gases of ammonia and of sulphurous acid combine so as to form a peculiar body always of the same composition, in whatever proportion the two gases may have united. It is $NH^3 + 2S$. By attracting moisture the body loses its yellowish-red colour, and turns white. Its solution, particularly after a little time, reacts as a solution of sulphate and hyposulphite of ammonia. The new acid, named *trithionic acid* by Berzelius, always forms itself by the solution of the anhydrous sulphite of ammonia. If the solution of anhydrous sulphate of ammonia be boiled with hydrochloric acid, sulphur is deposited with disengagement of sulphurous acid—a process similar to that which takes place by the solution of trithionate of potash. Concentrated sulphuric acid causes, still more easily than muriatic acid, a deposit of sulphur with disengagement of sulphurous acid. Salts of baryta occasion in the solution a precipitate of sulphate of baryta; the same takes place with the solution of trithionate of potash. The solution of nitrate of silver exhibits the same reactions with both solutions; the white precipitate, formed at first, turns black, having become converted into sulphuret of silver. The solution of bichloride of mercury reacts, likewise, in a similar way with both bisulphite of ammonia and trithionate of potash. The precipitate is *black* (sulphuret of mercury) if either of the two latter salts have been employed in excess; and *white* (sulphuret, combined with bichloride of mercury,) if the bichloride has been employed in excess. The solution of nitrate of mercury causes a black precipitate (sulphuret of mercury, with a minimum of sulphur). A solution of sulphate of copper produces no change in the ordinary temperature, but on heating it, black sulphuret of copper is precipitated. Thus, in treating $NH^3 + 2S$ (bisulphite of ammonia) with water, sulphate and trithionate of ammonia seem to be formed; and by treating trithionic acid with certain tests, it seems to be decomposed anew into sulphuric acid, sulphur, and sulphurous acid. Trithionates are undoubtedly also produced in other cases. They are probably generated if combinations of certain chlorides (for instance, that of chloride of zinc with chloride of sulphur—$Zn\,Cl^2 + 2SCl^2$) are treated with water, for sulphuric acid is formed in all these cases.—*H. Rose, in Poggendorf's Annalen der Physick und Chemie.*

ON SULPHURET OF CALCIUM.

I endeavoured, some time ago, to show that sulphurets of the radicals of the alkaline earths may be dissolved in water without being decomposed by the hydrogen into sulphuretted hydrogen and into hydrates of earths. The products can be separated from each other by their different solubility in water. Since of the three alkaline earths lime is the most difficult of solution, in treating sulphuret of calcium with water the greater part of the resulting hydrate of lime will remain undissolved, whilst the sulphuretted hydrogen is held in solution. Berzelius thinks it probable that the presence of carbon, with which the sulphuret of calcium is mixed (if obtained by heating sulphate of lime with charcoal), may have some influence in the chemical process. But I have examined the purest sulphuret of calcium, and obtained the same results as before. I had prepared the sulphuret by passing sulphuretted hydrogen gas over very pure lime heated to a red heat, till no more water was formed. The sulphuret of calcium thus produced was of a pure white colour. 0·557 grms. heated in the air, moistened with sulphuric acid, and heated once more, gave 1·049 grms. of sulphate of lime, which is the exact quantity calculated according to the atomic weight of calcium, as adopted by Berzelius. This sulphuret of calcium, repeatedly moistened with distilled water in closed vessels, gave at first sulphuretted hydrogen with sulphuret of calcium, and ultimately only pure lime-water, whilst hydrated lime remained, which exhibited no smell of sulphuretted hydrogen when dissolved in hydrochloric acid. This decomposition of sulphuret of calcium by water explains the considerable proportion of sulphur which is found combined with common soda, on treating the latter with water for the purpose of preparing carbonate of soda. The common soda (kelp) consisting of carbonate of soda and of sulphuret of calcium, a combination of sulphuretted hydrogen with sulphuret of sodium is formed through the influence of the water, as also carbonate of lime, because the carbonate of soda decomposes the combined sulphuretted hydrogen and sulphuret of calcium. On the other hand, this kelp contains caustic soda of great strength, which is probably formed by the influence of the hydrated lime (produced from the sulphuret of calcium) on the diluted solution of the carbonate of soda. When a sulphuret of sodium is formed (with a large proportion of sulphur) it can coexist with hydrate of soda without giving it its excess of sulphur, even at high temperatures.—*Heinrich Rose, ibidem.*

CLYSTERS OF BELLADONNA AGAINST ILEUS.

Instead of remedies introduced into the mouth, which only tend to increase vomiting, Dr. Karl Schwabe recommends the use of clysters of belladonna-root, followed by a warm bath. At least four scruples of belladonna must be administered in each clyster to produce the desired effect. So large a dose, by paralysing, as it were, the muscular fibres of the intestinal tract lying below the strangulated part, removes the spasmodic tension, and allows the upper part of the intestinal canal, in consequence of the removed resistance, to relax, or to push the occluding substance towards the lower end. In the following case real poisoning happened after the administration of the above dose of belladonna:—A strong man, fifty-two years of age, complained, about half an hour after the application of the clyster, of dryness in the throat and difficulty in swallowing. He gnashed his teeth, was convulsed in the upper and lower extremities, and began to be delirious. Pulse full and strong, but little accelerated; look wild and fixed; pupils dilated; face flushed. The author, fearing apoplexy, ordered a venesection to one pound and a half, and clysters of vinegar. Within four hours the above symptoms gradually disappeared, the bowels were relieved (promoted by small doses of castor-oil and coffee), and the patient completely recovered from his complaint.—*Brachmann, in Schmidt's Tahrbücher der Gesammten Medicin.*

THE INFLUENCE OF OXYGEN ON THE HUMAN SYSTEM.

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In this paper I propose to consider the influence of oxygen gas on the changes natural to the human body, and, in future communications, the results of those changes.

1. The discovery of Dr. Scherer, that the azotised proximate principles of plants and animals are identical, is the most important fact in physiology. The processes of digestion and nutrition hang upon it. But it has not only simplified our doctrines in regard to these two important functions, but also offers a solution of the still more recondite subject of the metamorphosis of tissues.

From the remotest antiquity it has been asserted, that the being of to-day is altogether distinct from the individual of twenty years back. Nutrition and repair have been abundantly investigated, but the waste of tissue, muscles, and glands has been neglected as beyond our reach. That constant death of parts which maintains the energy of the whole, has been too unpromising or humiliating a subject for physiologists. The dogma of Buffon, so grossly misrepresented and little understood, that the larger animals are accretions of the lower, is again appearing in a more philosophical dress to throw light upon the functions of the animal frame. Each molecule of the body, endowed with its proper life, passes through a cycle of existence without drawing with it the destruction of the machine of which it is an integrant; nay, further, that machine is endowed with new attributes by the arrangement of its minor parts. So a single cell in plants (*Chlorococcum vulgara*) is capable of inhaling gas and fluid, of decomposing carbonic acid in the sun's light, and forming chlorophyl, and starch, and albumen, but it has not all the properties of united cells; it cannot lay down an enduring trunk.

2. The analysis of vegetable fibrine from wheat and fibrine of blood gave Scherer—

(C) Carbon =	54·603 and 54·454
(H) Hydrogen =	7·302 and 7·069
(N) Nitrogen =	15·809 and 15·762
(O) Oxygen = (S) Sulphur = (P) Phosphorus =	22·285 and 22·715

Numbers which those familiar with the results of organic analysis will perceive, indicate perfect similarity of composition. These numbers have been reproduced in the researches of Mulder, Boussingault, Varentrap, Will, and Jones. It is not true of fibrine only, but the albumen and casein of animals and vegetables are identical. But of the two kingdoms, vegetables only possess the property of forming out of inorganic matter such important substances. This function of plants, upon which animal existence depends, is in its turn dependent upon the action of the sun's beams. By their quickening influence, the frail cellules of an humble weed can destroy the chemical affinities of the atoms of carbonic acid, which no galvanic battery can effect, and uniting the carbon with water, lay the foundation of these nutritious bodies. Some fungi are, indeed, eminently nutritious, although growing without light, and beneath the surface of the soil, as the truffle (*Tuber cibarium*), but these are secondary organizations, depending upon the presence of organic matter in the earth—the destroyers rather than the producers of vegetable principles.

3. The animal machine being incapable of forming fibrine, depends for its supply upon plants, and by their ingestion it enters the stomach. Its fate therein cannot be discovered from all the works on physiology previous to the time of Scherer. So sublime did the mystery of digestion appear, that those medical men who have not kept pace with the advance of chemical knowledge, can hardly be persuaded that it is no more than a case of solution. Fibrine digested, which they would have termed fibrine vitalised, animalised, chymified, made fit for the nutrition of human beings, is, indeed, in our day no more than *fibrine dissolved*.

By what route we care not, by lacteal or absorbent, it reaches the blood, and there Mulder and Scherer prove that it is no more than the identical fibrine which we trace in a vegetable juice, or the seeds of the cerealia.

4. Passing with the current of blood along the circulation, ever ready to put on the insoluble form as soon as the chemical requisites to its solubility are disturbed, each atom ultimately reaches its place of destination in the system. Imprisoned in a capillary, which allows no further progress to the denser parts of the blood, one principal condition of the soluble state, *motion*, is arrested, and fibrine reaches its appointed station to form one monas of a complex animal. Nutrition is no more, in this case, than precipitation, for Playfair and Boeckmann show that the composition of blood and the bodies produced therefrom are similar.

But the position occupied by the newly-added molecule is not fortuitous, certain forces having guided its career, and they continue to control its destiny. These are nervous power and vitality, or that collection of actions which physiologists are pleased to call vital, because unable to separate into their components.

5. The place of deposit, wherever it may be, forms part of a perishable tissue—the fibrine becomes subject to the law of the structure. As an independent body, it might have retained its form for ever if removed from the agency of moisture and oxygen, or it might have experienced decomposition in a few minutes. But its fate is now determined by the necessities of the system, this condition remaining, however, that in its complete decay the same agents are required and the same products generated.

6. Fibrine decaying in atmospheric air is surrounded with an abundance of oxygen gas and moisture; its resulting products are dependent upon these conditions. To place the study of this decomposition in a clear light, I shall adopt the atomic constitution of fibrine—carbon 800, hydrogen 620, nitrogen 100, oxygen 240, phosphorus 1, sulphur 2, with 0·77 per cent. of sulphates and phosphates of lime and magnesia (Kane). Under the freest supply of oxygen, and in circumstances producing slow decay, all the carbon would form carbonic acid, all the nitrogen would unite with hydrogen to form ammonia, and the hydrogen in excess would form water.

Thus the atom of fibrine, omitting the sulphur, phosphorus, and saline matters, would be resolved into—

100 ammonia =	N100+H300
320 water =	H320+O320
800 carb. acid =	O1600+C800
	N100+H620+O1920+C800

and for the change 1680 atoms of oxygen are required more than the fibrine contains. This perfect eremacausis would, however, occupy much time, and requires a slowness of decay foreign to azotised matter. The truth is, that although the preceding products would be formed, if the conditions were maintained, yet, in the destruction of such bodies, the decomposing forces are of too active a nature to give time for the amount of oxygen necessary to become absorbed, and new but feebler affinities between carbon, nitrogen, and hydrogen come into operation.

If the fibrine decays under the influence of fermentation, which is an active process, the compounds of carbon, hydrogen, and nitrogen are produced much more freely. Cyanogen, carburetted, sulphuretted, phosphuretted hydrogen make their appearance as well as ammonia, water, and carbonic acid—not in virtue of a specific operation, but because the ratio between the rapidity of decay and absorption of oxygen is altered. Just as the difficulty of procuring oxygen increases, the production of hydrogen compounds increases; and in those situations where it cannot be absorbed, hydrogen compounds only are formed.

It is this law of nature which has secured to our race the invaluable mineral *coal*. If the vegetable matter from which it has been produced had been abundantly supplied with oxygen during decay, every atom of carbon would have become carbonic acid. But as soon as the atmosphere was excluded, all change ceased with the last portions of hydro-carbon formed, leaving nearly pure carbon in anthracite.

7. In the human body the atom of fibrine, now a molecule in a muscle or other organ, suffers death or decay under similar laws. If we turn our attention to the ejected products of animals, we discover in *health* an entire absence of compounds of hydrogen with carbon, sulphur, and phosphorus: these bodies, I have said, mark the want of oxygen, and are the result of rapid decay or fermentation. The living body does not, therefore, in rejecting its effete parts, adopt under normal circumstances a fermentative process. Neither does it proceed by a perfect oxidation or eremacausis, for we are aware of the generation of compounds of nitrogen with carbon. What, then, is the character of the change?

8. We can obtain a knowledge of it only by considering the products resulting. In the discussion of extra-animal decay, the character of the decomposition is known by studying the nature of the bodies generated; this is also the method in investigating the ultimate metamorphosis of tissues.

All the normal constituents of the animal frame may be classed under the distinct heads of fibrine, or protein compounds and fats. We may simplify our discussion without the remotest shadow of error, by leaving the latter bodies out of view, and regarding only the protein class. Again, we may confine ourselves to fibrine as a representative of the whole class, and by determining its changes, argue fully and correctly to that of every portion of the frame. Omitting partial transformations into chondrine, hair, gelatine, arterial membrane, and secretions, so ingeniously discussed by Liebig, I will proceed at once to the perfect metamorphosis of fibrine into effete matter.

9. The excreting organs, whereby the products of decay are thrown from the system, are the kidneys, lungs, skin, and cutaneous glands. They are not to be confounded with the secreting glands, the liver, spleen, testes, parotids, thyroids, salivary, pancreas, mammæ, mucous exhalents, &c. In which list I have included several structures whose office is unknown, but it is certain from their situation that they are not excretors. The liver, pancreas, and salivary glands have thus been cousidered by some, but improperly, for the saliva is an important adjunct to digestion; the liver and pancreas, by throwing their secretions into the unabsorbed chyle, are evidently intended to alter the form of substances which have passed through their structure, and fit them for a return into the animal economy.

Nor is the discussion affected by our ignorance of the office of many glands. The constitution of expired air is no matter for cavil; the composition of urine and the character of cutaneous excretions are known, and this knowledge is sufficient in itself to furnish us with the history of every particle of fibrine that suffers decay.

10. Searching in the urine for some of the products of decay, we learn that principally azotised and saline matters are drained off from the system by the kidneys—those azotised bodies which have reached a state of metamorphosis that not only unfits them to remain in the tissues of the body, but renders them injurious to health. They must not be confounded with such fluids as have only reached a partial change, as bile (C37, H66, N5, O22), and contain nitrogen, and are subject to further decay, before thrown out of the system as effete.

11. The exact nature of the urinous azotised matters, will be seen in the accompanying analysis of urine by Berzelius (*Chemie*, t. vii. p. 392).

Water	933·00
Urea	30·10
Uric acid	1·00
Lactic acid and lactate of *ammonia*	17·14
Mucus	0.32
Sulphate of potash	3·71
Sulphate of soda	3·16
Phosphate of soda	2·94
Biphosphate of *ammonia*	1·65
Chloride of sodium	4·45

Muriate of *ammonia*	1·50
Phosphate of lime and magnesia . .	1·00
Silica	0·03
	1000·00

Of the above substances those in italics contain nitrogen. It is worth while to consider the composition of these bodies with regard to the other elementary constituents.

Urea consists of	N2+C 2+O2+H4
Uric acid . .	N4+C10+O6+H4
Ammonia . .	N1 . . H3
	N7. C12. O8. H11

As there are 100 atoms of nitrogen in the formula of fibrine (6), we may elevate the nitrogen in the above sum to that number, preserving the form in regard to other elements: the process gives nearly N100, C171, O114, H157. This calculation is based on the supposition that the quantities of the azotised bodies in urine are in proportion to their atomic weights; such, indeed, is not the case, but the proportion of nitrogen is higher, for of the substaces enumerated, urea and ammonia constitute nearly the whole, and the former contains little carbon, whilst ammonia is without any.

If we contrast the ratio of the elements to each other, in the table, with the composition of fibrine, we cannot fail to be struck with the large amount of nitrogen in comparison to the carbon; whereas in fibrine they are as 1 to 8; in urea they beeome as 1 to 1; in uric acid as 2 to 5; and in ammonia the carbon is absent. These proportions will not be lost, whatever be the relative amount of the different urinous compounds.

So far, then, urine is a much more azotised product than fibrine, and on the ground that it results from the decay of the latter, a large quantity of carbon is unaccounted for.

12. If the water of urine be taken into the aecount, as it should be, an additional amount of oxygen and hydrogen are separated from the elements of fibrine. What the exact amount of water produced by the combination of its elements derived from decaying fibrine may be is uncertain, for water drank by the individual escapes by the kidneys also. This much is, however, certain, that just in proportion as the oxygen and hydrogen are separated from the components of fibrine, the exeess of unappropriated carbon increases.

13. Nor can we escape the conviction that the kidneys are not destined to separate this element by discovering the presence of lactic acid (C6+H4+O4) and lactate of ammonia in urine. Laetic acid by the formula contains 1½ times as much carbon as oxygen, but in fibrine the ratio is as 10 to 3; if, therefore, a sufficient quantity of lactie acid were present to eonsume all the oxygen of fibrine, 440 atoms of carbon would still be ununited. This acid is by far the most highly carbonised eonstituent of urine. But as there should be no doubt left on the mind as to the office of the urinous excrement, it is proper to observe that lactic acid is not a product of the deeay of fibrine. Purely carnivorous animals eject uric acid principally, serpents only urate of ammonia. The presence of lactates arises from the deeay of bodies of the stareh family remotely, or of the oleaginous family approximately.

14. There remain the saline matters of urine; phosphate of lime and magnesia are proper to fibrine. Phosphate of ammonia is generated by the oxidation of the atom of phosphorus of fibrine, and the subsèquent union of phosphoric acid with ammonia of the decaying matter. Part of the sulphuric acid is also the result of the oxidation of the two atoms of sulphur. The remaining saline matters are derived from other proximate substances, and from salts taken with food.

The presence of mucus in minute quantity is to effect a furter decay of urea and uric aeid. These substances, when chemically pure, are staple, but in the presence of putrefactive agents and oxygen, are resolved into ammonia and carbonic acid.

15. Upon a thorough investigation of the history of each constituent of urine, we are still left with a large quantity of carbon after the separation of every other element. It is unnecessary to trace the separation of the hydrogen; for in all the foregoing products of decay, urea, uric acid, ammonia, and water, it is present in high proportion.

16. Perspiration is another form of excretion by which a part of the products of decay leaves the body. It usually puts on the form of vapour in passing from the skin, but when exhaled in large quantities, or in an atmosphere with a dew point approaching 90° F., it becomes fluid. In both conditions, as insensible perspiration or sweat, it has been chemically examined, the former by Thenard and Anselmino, the latter by Berzelius and Anselmino.

17. Perspiration consists of water holding in suspension saline matters, a little animal matter, and carbonic acid. Some of these substances are volatile, others fixed. As long as insensible vapour only passes, the volatile portions escape from the skin, but leave behind a pellicle of saline matter, which forms the scurf of persons negligent of cleanliness. An accumulation takes place, especially in the armpit and groin, from the activity of the cutaneous glands in those regions of the body. In sweat, the fixed salts flow off in solution.

18. From the examination of Anselmino, reviewed by Berzelius, we learn that 100 parts of sweat contain 0·5 to 1·25 per cent. of substances not volatilised by a water-bath. This great difference depends upon the quantities of water drank. Of the solid matter 22·9 per cent. was indestructible at a red heat—making 0·114 to 0·286 per cent. of saline matter in sweat. The salts are carbonate, sulphate, and phosphate of soda, with traces of similar potash salts, chloride of sodium, carbonate and phosphate of lime, and a trace of oxide of iron. The carbonates of this list are the remains of incinerated lactates.

Among the volatile substances are lactate of ammonia, and an oil possessing the peculiar odour of the animal.

Carbonic acid, in a free state, was found in minute quantity by Anselmino; Collard de Martigny subsequently discovered nitrogen and hydrogen, but in uncertain quantities. The nitrogen has been traced by Liebig to atmospheric air taken into the stomach with saliva. It is apparent that where large quantities of water are drank, the nitrogen and carbonic acid must escape through the skin and lungs. Those who visit sulphur springs are aware of the exhalation of sulphuretted hydrogen by the epidermis. These minute quantities of gas are not, however, the product of decaying fibrine; for, with the exception of water, carbonic acid, and ammonia, the results of its metamorphosis in the system are dissimilar from the products of putrefaction. Both urine and perspiration are thrown out of the body with a portion of animal matter (mucus), that the final steps of decomposition may be accomplished out of the frame. Food, especially that which has commenced to ferment, or is very prone to change, may liberate gas in the intestinal canal, but this has no connection with the metamorphosis of tissues.

The principal constituent of perspiration is water; no doubt a portion of it is drawn from the oxidation of the hydrogen of fibrine, but the greater part must be derived from fluid taken into the stomach.

Little of the surplus carbon is separated; for, although carbonic acid is a constituent of its excretion, and oxygen may be absorbed by the skin, both these actions take place to so limited an extent, that it has hitherto been considered too unimportant to be measured.

19. It may be proper, before entering on the study of the excretion of the lungs, to make some remarks on the mucous membrane of the intestinal and urinary apparatus. These have been regarded as the internal skin by many physiologists. If such be the case, should we not look upon it as an excreting surface, and enumerate its products with those of the kidneys and lungs? But that this is not incumbent upon us will appear from an examination of the matters thrown out by these mucous membranes—not where they are full of glands—but in the most simple state, as in the male pelvis. If any notable excretion were thrown off the mucous membrane of the urinary system, it would be found in urine. Yet, upon examining that fluid, we find only 0·032 per cent. of mucus which has not been derived from the kidneys. The office of the mucus has been explained; it is not an excretion, but secretion.

It may be imagined that, notwithstanding the absence of excretion in the urinary mucous membrane, the quantities of mucus, or fluids evaporating from other portions of the tissue, may be considered excrementitious. This speculation can be readily disproved. If the lining membrane of the intestinal canal throws off any quantity of fluid, it cannot be in the form of vapour, but as liquid, inasmuch as the perfect saturation of the gases contained in the canal renders the process of vaporisation impossible. The hypothetical fluid produced in the upper parts of the tube, as the œsophagus, running downwards into the stomach, would be absorbed by the spongy tissue of that organ in the same way as water. But the absorption of excretions is unnatural, and contrary to the laws of the organisation. With respect to the fluid excreted according to this hypothesis in the small intestines and colon, omitting the absorption, unless produced in immense quantities, it is evident that in a state of health the stools containing so much fluid should be watery! How certainly absorption of liquids takes place may be gathered from the well known facts, that persons suffering from constipation, eject indurated fæces; and injections of soups, &c., into the rectum, have served to maintain life in cases of lock jaw, &c., for weeks.

But if the excretion of a quantity of fluid were a function of the mucous membrane, what fate would await the lungs of persons resident in moist tropical countries? Vapour of water exists in expired air, but it is not necessarily an excretion of the mucous membrane. The amount of vapour derived from the lungs, is directly as the drying power of the inspired air, which proves it to be no more than the exhalation of moisture produced on mechanical principles. Thus, if the dew point of inspired air be 98° F., the passage of vapour from the surface of the mucous membranes becomes nothing. Or, in other words, if we allow that the secretion of fluid is a function of the mucous membrane, we must likewise admit that in health the action may be suspended for months without any apparent disturbance. This amounts to an absurdity. Another consequence, no less unnatural, attends the assertion that mucous textures excrete a fluid; if the function existed, a dew point of 98° F. would not arrest it; how is it that with the epidermis, under that atmospheric condition, perspiration ceases, but copious and compensating sweat is produced? So in the lungs, sweat or fluid should be formed sufficient to counteract the pressure of the dew point. Does any one believe that it is so produced?

The halitus of mucous membranes, and the moisture of expired air, are, therefore, not excretions, but owe their origin to mechanical causes.

20. If we turn our attention to the solid dejections, we find no evidence of intestinal excretion. The solid itself consists of those portions of food which are insoluble in chyle, in excess, or innutritious, and therefore not appropriated by the system—we find no mucous excretion. It is not in the excrement of an over-fed, luxurious gourmand, we are to expect this result; for in such cases an irritation of the lining membrane of the larger intestines may cause them to throw out an abundance of mucus. But, turning to the lower animals, let us examine the character of the fæces of a healthy dog, fed on meat and bone;—it is well known to consist of a white friable substance, called album graxum by the older pharmacologists, and yielding, on analysis, scarcely anything but the inorganic matter of bones (phosphate of lime), which is insoluble in chyle. In the case of carnivorous birds, also, we find nothing but the urate of ammonia, with inorganic matters as excrement, a trace of mucus, sufficient to produce decay, being added, as in the case of urine.

21. These facts are of deep interest to physiology, not only as proving that there is no such thing as mucous excretion, but also in their bearing on the important question of the office of bile, which is still considered an excretion, by medical men. On this subject I may now pro-

nounce a decided opinion, that bile is not an excretion, or in any way concerned with the ultimate decay of fibrine. The proof is found in its entire absence in the preceding cases; but, in addition to these, it was my misfortune, some years since, to lose a friend by death, whose ductus communis choledochus had been obliterated by the passage of biliary calculi eight months before his decease. During the whole of this time no bilious secretion was thrown into the bowels, and yet he enjoyed a tolerable amount of health. The further history of the case I will communicate in this journal on another occasion.

It is not my object to assert that bile may not be found in any specimen of excrement. Berzelius gives 0·9 per cent. of it in a specimen of human fæces examined by him. But its presence indicates that the quantity formed by the liver is too great for re-absorption, or that some other disturbing cause is in action; and, considering the great irregularities of men in taking food, this is probably a frequent case.

22. There remains but the pulmonary excretion to carry off the surplus carbon left from the decay of fibrine (15). To this office it is destined. The carbon has, however, to be converted into carbonic acid to render its escape practicable. Hence the absorption of oxygen from the external world becomes necessary. In addition to carbonic acid, expired air contains a varying quantity of vapour of water, and sometimes a minute increase of nitrogen. Of the former I have spoken already; the latter derives its origin from air taken into the stomach with saliva or water, and is not a product of decay.

The lungs are at once destined to excrete carbon and absorb oxygen gas—but the union of these elements to form carbonic acid does not take place to any great extent in the pulmonary apparatus, but in numerous points in every part of the body where fibrine and other animal bodies are undergoing metamorphosis; the acid thus formed is conveyed to the venous system, and subsequently thrown out by the lungs.

23. The entrance of oxygen, under these circumstances, into the circulation, has been a subject of much debate amongst physiologists. We have not time now to discuss the many ingenious hypotheses advanced in favour of and against this view. They are all subject to grave objections, and I should have dismissed the matter had not Professor Mulder's paper on the oxidation of protein reached me in time. From his analytical researches, it appears that protein, which is fibrine without its saline matter, oxidised in the lungs by the reception of three equivalents of oxygen, and becomes C_{40} H_{32} N_5 O_{15}. In this way the oxygen is carried to every part, and wherever there exists a chemical affinity requiring that element, the fibrine abandons it probably at the loss of its soluble state. In other words, the conversion of oxygen by fibrine is attended with two results, the simultaneous supply of the gas to atoms undergoing eremacausis, and the deposition of fibrine in the proper point as a substitute for the loss. Hematosin is also recognised by Mulder as a means of distributing oxygen. The view of Liebig that the means was the peroxidation of the iron of blood is unworthy of that splendid chemist.

24. We are now prepared to answer the query proposed—What is the character of the decay fibrine undergoes within the animal body, in its ultimate change? The features of putrefactive fermentation and complete eremacausis (6) have been given; to neither of these processes does the change belong. Neither gaseous carburets, sulphurets, or phosphurets are produced as in fermentation, nor is all the carbon converted into carbonic acid, and the hydrogen not consumed in forming ammonia united with oxygen to generate water. The former of these compounds marks a minimum of oxygen, the latter a great abundance. Time is an essential element in these changes, for if the action be reduced to a minimum, abundance of oxygen being present, a portion of the nitogen will also be oxidised or converted into nitric acid.

The decay of fibrine in the frame is also dependant upon the oxygen, but takes its character neither from excess nor deficiency of supply. The reason is to be found in the capacity of the lungs. To convert all the carbon into carbonic acid and 320 atoms of hydrogen into water, would require the absorption of 1680 atoms of oxygen more than the fibrine contains; but by separating a portion of these elements in the form of urea and uric acid, the amount of oxygen necessary for metamorphosis is considerably diminished. The lungs cannot, under ordinary circumstances, supply sufficient oxygen for complete eremacausis.

25. That the capacity of the pulmonary apparatus and frequency of respiration are the true causes of the peculiar decay of sub-eremacausis of the living frame, is proved by the changes which occur in the products of the urine. The amounts of urea and uric acid are perpetually fluctuating. In persons who are active, urea is considerably in excess, or the sole result, while in sedentary persons, and those who suffer from confinement, uric acid increases in proportion. Urea contains more oxygen than uric acid, for urea equals C_2 H_4 N_2 O_2, or carbon 2, oxygen 2, and uric acid (C_{10} N_4 H_4 O_6) only 6 of oxygen to 10 of carbon.

26. It is unnecessary to state that the decay of parts is essential to the welfare of the whole—that upon the cessation of atomic metamorphosis the destruction of the system ensues. The nature of the decay we have reduced to one primary condition, the amount of oxygen entering the body, but there are disturbing causes which control the quantity, and direct the metamorphosis of parts. These are, frequency of respiration, and the nervous power. The balance of these three component forces cannot be disturbed without the production of change, which may eventuate in disease. Let the respiration become greatly increased, larger amounts of oxygen enter, the fibrine in the blood is converted in excess into the tritoxide of Mulder, which is identical with the *buffy coat of the practitioner*, the transfer of the oxygen therefrom, to various parts of the body, exalts the temperature by hastening the changes of metamophosis, more urea is produced (Prout)—in other words, a fever is the result.

27. The amount of oxygen entering controls the result. If, then, the nature of the decay be dependant upon an external agent, what is the influence of vitality in the process of metamorphosis? In other words, is this a case of vital change, produced under peculiar laws, independant and superior to chemical laws, that is by the vital force? I answer it is not; that the process is purely chemical, and subject to no disturbance whatever; the places where change takes place in the economy are regulated by other causes, not by the admission of oxygen only, but the products of decay are formed solely under the agency of chemical forces. There is no difference between the decay of fibrine necessary to health, and external decay, conducted in such a manner as to yield urea, uric acid, ammonia, carbonic acid, and water. The real difference between the metamorphosis of animal matter and similar external decomposition rests in this important particular, that in health the removal of one atom of fibrine is attended with the deposition of another, capable of performing the same function—this timely and essential addition is the work of what may be called the vital force, for upon it vitality depends.

28. Therefore, the fibrine of the bodies of animals is subject to a peculiar decay, depending upon the access of oxygen, and being a sub-eremacausis whereby urea, uric acid, ammonia, water, and carbonic acid are produced. This may be termed *vital eremacausis*, because activity depends upon it, and as a means of separating the change from putrefaction, and complete eremacausis.

Vital eremacausis owes its character to the circumstances—that it occurs at a fixed temperature, 98° F., that the supply of oxygen to the amount of fibrine changed is rigorously limited, and the time in which it takes place is also determinate. Alter any of these conditions, and the nature of the decay changes; there is nothing specific in it; the amount of change may bring about disease, but, if radically altered, death is the result.

Nor am I chargeable with examining the effect instead of the cause. Fibrine, as such, whether in the texture of an animal, or in the laboratory, like every other definite chemical compound, is so constructed that its atoms are in equilibrio,—it has no innate power of change, but when removed from external agencies may remain *fibrine* to eternity. It is altered only by external causes, and the product depends upon the cause. In the human body, the causes of change are oxygen and moisutre; these, therefore, must be present primarily, or, in other words, inspiration of oxygen is the first act of existence.

The metamorphosis of matter is, therefore, the cause of activity, for no particle of fibrine undergoes decay without the production of those molecular forces which are the producers of heat, light, electricity, and other effects. If the metamorphosis is hastened, as by the use of protoxide of nitrogen, or by rapid inspiration, the activity is heightened—in these cases, an increased quantity of oxygen enters in a given time, but must be appropriated; it cannot be rejected as an element from the system, and it therefore acts upon more atoms of fibrine.

It will be perceived, however, that the oxygen diffused throughout the economy by the blood, has not the power of spontaneously deserting the fibrine (with which it is combined, according to Mulder), but does so only under the influence of molecular forces. Were it otherwise, the oxygen would act exclusively upon the first atoms of fibrine it encountered—but we know that changes may become much more active in one part of the body than another, without respect to its distance from the lungs. There is, therefore, a power which protects one atom of fibrine, whilst it exposes another to decay. Without the existence and recognition of this force, the action of oxygen would be destructive instead of sanative, and no chemical theory is tenable without it. What the force is, or whence it originates, is not for discussion now; there is no question that it manifests itself through the nervous system. It has nothing to do with the products of eremacausis, for, whenever an atom is abandoned to the action of oxygen, chemical forces only come into operation

It may be agreeable to call the directing force vitality or vital force, for it undoubtedly regulates waste and supply, directs motion and growth, but it does not act in violence to chemical or mechanical forces.

EXTRACT OF A MEMOIR ON VEGETATION CONSIDERED IN A CHEMICAL POINT OF VIEW.

By MM. F. C. Calvert and E. Ferrand.

Guided by the learned works which have lately thrown such light on the important question with which we are occupied, we proposed to ascertain, by chemical analysis, the change which the decomposition of the air contained in the plant undergoes, in the vegetables themselves, according to the organs in which the phenomena occur, and according to the circumstances which govern the modification of the phenomena.

In the first chapter of our memoir, we first discuss the value of the experiments made for proving the decomposition of carbonic acid by plants under the solar influence, and we show why we think that we are placed in conditions more favourable to this study, by not deviating from natural circumstances, that is to say: by studying the air contained in certain parts of the vegetable, the plant living and in full vegetation. We content ourselves with noticing here the principal objections which may be opposed to the investigations on this subject undertaken before us, and we will take as an example the experiments made by M. Theodore de Saussure, a celebrated chemist, who, as is well known, was occupied for a long time with this same question.

Thus, we think that a vegetable, confined under bell-glasses, and, consequently, in a limited atmosphere, is placed in circumstances essentially fatal to the appreciation of natural phenomena; the author, indeed, experimented on entire plants, and on leaves detached from trees, and on these two orders of investigation the following observations may be made:—

1. In the first case, under a bell-glass, over mercury, the entire plant at first, and more especially the layer of water, with which, for the sake of precaution, the metallic bath is covered, very soon saturates its limited atmosphere with moisture, and transpiration, having become impossible, does not impede without inconvenience a function of the organisation of plants.

2. Carbonic acid being an aliment indispensable to vegetables, how can it be conceived that they are nourished for some time in a medium in which, in very small quantity and not resupplied, this acid is immediately absorbed and decomposed by them in the sun?

3. In an expired air, if the nutritive element be wanting, on the one hand, and if, on the other hand, a disorganising principle, oxygen, be increased, the diseased state of the beings which respire it may readily be foreseen.

4. How clearly do the conditions of life and health appreciate this state of disease and suffering, often detected by the decolouration and fall of the leaves, and the non-maturation of the fruits?

5. In all the experiments thus made under bell-glasses, the absence of the soil has never been taken into account, and still the presence of certain salts is a necessary thing—an imperative want, as is seen every day in agriculture by the predilection of most crops for such and such mineral substances; doubtless, in the circumstance whose value we have just estimated, plants deprived of all kind of earth round their roots suffered little; but this sudden passage to this abnormal state could not but disturb the equilibrium of the vegetable functions, the harmony of the natural phenomena, and furnish causes of error.

The well-known experiment of M. de Saussure on the pervenche prove the complete absorption of carbonic acid; but the results of this operation, in establishing that a portion of the oxygen was retained, whilst an equivalent portion of nitrogen was produced by the plant, do not demonstrate, in our opinion, that all the carbonic acid was decomposed into carbon and oxygen.

To the experiments made on cut branches, leaves, &c., we may apply not only the foregoing objections, but another one in our opinion more serious;—that is: that the causes of considerable alteration must act so freely in the case of which we speak, that we think that this has been mistaken for a vital action a true chemical decomposition of the juices or tissues of plants.

M. de Saussure thus summed up on the leaves or dead parts of plants:—*

"Green plants exposed in atmospheric air to the successive action of day and night, make in it alternate inspirations and expirations of oxygen gas, mixed with carbonic acid gas. The oxygen gas which the plants inspire is not immediately assimilated in them; it is converted, in the inspiration, into carbonic acid; they decompose the latter in the act of expiration, and it is only by this decomposition, which is but partial, that they can assimilate the oxygen gas which serves them as an atmosphere."

The experiments whose results we have just read were made on the *Cactus opuntia*, placed under bell-glasses closed with mercury, and the author ascertained by these observations that oxygen was inspired in the night and expired in the day.† It is difficult to conceive how the author could conclude from these results the formation of carbonic acid at the expense of the carbon of a leaf said to be in full vigour; and it is still less explicable how this acid produced is retained in the state of gas in the very tissue of the vegetable (an opinion which this chemist owns, at p. 76 of the same work, not to have been demonstrated by direct experiments), and thus waits to be decomposed under the influence of the solar rays.

Is it not more probable that the oxygen absorbed by the leaves or branches is called into operation by its property as a supporter of combustion, and that it does not burn carbon, because this carbon is already combined, and, consequently, has no tendency to unite with oxygen; for this slow combustion, this destruction, could take place by the oxygen absorbed only, inasmuch as light had not restored to these parts of plants all their vital faculties—all their power of resisting decomposition; and we will support our observations by an experiment of the same author on the *cactus*. We will add, however, that we cannot regard the phenomenon which is produced during life as similar to those which take place after death. Indeed, in the experiment of the disorganised cactus, carbon is no longer retained by a vital force susceptible of counterbalancing the combustible action of the oxygen on the carbon; carbonic acid is also disengaged without interruption.*

The experiments on fruits do not appear to us more favourable than those on leaves and stems to the explanation of the manner in which plants act on carbonic acid. Indeed, M. Berard† gathered fruits and placed them in flasks exposed to the sun, and in darkness, and he remarked in all his experiments that the air was continually vitiated by the constant production of carbonic acid, whatever were the circumstances of light and the state of maturity of the fruits.

These results, furnished to the author even under the solar influence, do not enable us to understand an increase of weight, in despite of permanent loss of substance; and we should be led to apply to these works the same observations that the experiments already noticed have suggested to us, for it may be perfectly conceived if carbonic acid is disengaged even in the sun, it is because in organs which so readily enter into fermentation after being gathered, the vital force is no longer sufficiently powerful for preventing the acidification of the carbon.

The memoir of M. Berard was partially refuted by MM. Theodore de Saussure and Couverchell; and as the refutations were not based, to our knowledge at least, on experiments, we have undertaken on this subject a work which we hope will leave no doubt concerning the decomposition of carbonic acid in fruits under the solar influence.

The object of our first investigations was the examination of the air contained in the husks of the bladder-nut tree—experiments which indubitably destroy M. Berard's opinion, that the pericarp of these husks is permeable to any extent to the external air; for, adds the author, the air which they contain is that of the atmosphere. To this conclusion we reply that this permeability of the husks to the air exists only within very narrow limits, while the gas which fills these husks contains 3 per centt of carbonic acid. It might be objected to us tha this large proportion of carbonic acid gas is the effect of a production by the fruit itself; but, in reply to this observation, we would remark that, in our analyses, the quantity of oxygen was always in exact proportions, and always increasing with the decomposition of the carbonic acid in a given time, and under a determined intensity of light. We have observed, on the other hand, in the course of our operations, that the maximum of carbonic acid was found in fruits at night, and that, in order to obtain this maximum, from five o'clock in the afternoon till eleven o'clock at night, the increase was about 1½ per cent., an increase which it is difficult to explain by the present theories. One of them, indeed, admits that the plant, under the solar influence, absorbs carbonic acid, which it immediately decomposes, and that in the dark the plants disengage the small quantities which they derive from the ground by their roots. The other theory also admits a constant absorption of carbonic acid, which, during the day, is concentrated in the shade, and, during the night, is accumulated in all parts of the plant: thus, as in the foregoing theory, the decomposition commences only with the first rays of the sun. Finally, it regards the nocturnal expiration of the gas only as a very limited disengagement relating only to the more or less abundant transpiration of vegetables during the night.

By receiving the first theory, we cannot account, in a satisfactory manner, why the sum of carbonic acid found in the night in the husks, being represented by 3, loses 1·5 in the morning of the next day, and regains precisely 1·5 in the early part of the following night, so as to equal 3, the original quantity; for, according to this theory, it must be admitted that the passage of the acid into the parts of the plants is continual, the roots being always in the same condition of darkness; and this cannot be admitted, in our opinion, in the presence of our analyses in the day, whose proportions of carbonic acid diminish the ratio of the intensity of the solar light, and these quantities always remain in relation with those of our analyses of the night.

If we have allowed ourselves to advance that which we have just stated, it is because our experiments, repeated a great number of times, and at very distant periods, have always given uniform quantities of carbonic acid.

The second theory, attributing only to the direct rays of the sun the property of fixing the carbon, liberating the oxygen of the acid, seems to us to give no better explanation than the foregoing of the facts which we have observed, for it does not notice the decomposition of carbonic acid in the shade; and we may add, that the chemists who have studied this question do not appear to have taken account of the progress which the decomposition of carbon in vegetables follows, according to the length of time they are exposed, either to diffused light, or to the sun.

We think that plants absorb carbonic acid only during the night, and that the quantity, condensed, is greater than those which they are capable of decomposing next day, under the luminous rays. This absorption would take place in the following manner:—

The surrounding air, which contains, it is true, very small proportions of carbonic acid (4-10000ths to 6-19000ths), but quite sufficient for vegetation, as has been proved by interesting calculations, is incessantly removed round the leaves and stems, by the continual motion to which a number of physical causes excite them, and consequently presents to the plant, in a very short time, always fresh quantities of carbonic acid. Now, plants thus placed in a medium which presents to them an indispensable aliment, carbonic acid, absorb this gas, and neglect the other elements of the air; that is to say, in other terms, they condense it, without an absorption or an exhalation of these same elements being observed.

For the appreciation of the natural phenomena based on the decomposition of the carbonic acid, we commenced this part of our work by the examination of the air contained in fruits; and we thought that we should place ourselves in circumstances favourable to this study by adopting the following course:—

We took for a type of our investigations husks of the *Colutea arborescens*, which we have said to be permeable to the air only within very narrow limits; and it was only with the mother plant, exposed to the open air in the *Jardin du Roi*, which we gathered immediately before being burst under mercury, in order to collect the gases under bell-glasses prepared for that purpose. This selection enabled us, moreover, to follow the influence of different periods of maturity on the nature of the gaseous mixtures which envelope the seeds; and finally, to appreciate properly the action of the light, according to its intensity.

We, therefore, chose dull days, and days perfectly illuminated by the sun. Then, in both cases, we collected the fruits at determined hours, and always the same, viz.: at seven o'clock in the morning, at noon, at four o'clock, and at eleven o'clock at night.

The experiments commenced on the 10th of July, and were continued until the end of September.

The husks of colutea require about a month to arrive at maturity, and we took them in the three most sensible conditions of their period of growth, namely:

1. Those which have begun to be developed for a week or most, we will call *young*.

2. Those which after fifteen days or three weeks have attained their full size, but whose pericarp and

* *Recherches Chimiques sur la Vegetation*, p. 133.

† See, for further details, *Recherches Chimiques sur la Vegetation*, by Theodore de Saussure: experiments of the night, p. 66, and those of the day, p. 82.

* See p. 219.

† See M. Berard's "Memoir on Fruits," *Annales de Chimie et de Physique*.

grain are still green, we designate by the name of *intermediate*.

3. Those which before dehiscence are transparent, almost dry, and whose seeds are coloured, we will call *old*.

These fruits, immediately after being gathered, are burst under mercury, in bell-glasses prepared for the purpose, and the moisture of the gas is separated from the carbonic acid by means of sulphuric acid. After this first operation, the dried gas is transferred into graduated bell-receivers, in which cylindrical caustic potassa indicates, after 24 hours, the absorption of carbonic acid.

We stopped at the employment of the hydrogen eudiometer, for measuring the oxygen, taking all the precautions which this means of analysis admits of. In all instances, both in estimating the carbonic acid, and in determining the oxygen, we always took account of the corrections rendered necessary in the calculation by the variations of temperature and pressure.

We will content ourselves by giving here the comparative tables of the mean quantities of carbonic acid and oxygen contained in the husks according to the state of the sky, and the hours of our experiments.

INTERMEDIATE HUSKS.

Hours of the Exprt.	State of the Sky.	Oxygen per cent. in vol.	Carb. Acid per cent. in vol.	Oxygen & Carb. Acid united.
11	Night.	20·496	2·746	23·242
7	Morning, dull	20·673	2·618	23·291
12	Noon, dull . .	20·908	2·429	24·337
4	Aftern., dull .	20·901	2·432	23·383
7	Morning, sun	21·086	1·903	23·989
12	Noon, sun . .	21·293	1·419	22·712
4	Aftern., sun .	21·173	1·438	22·614
			Mean . . .	23·081

YOUNG HUSKS.

11	Night	20·583	2·639	23·222
7	Morning, dull	20·626	2·605	23·231
12	Noon, dull . .	20·766	2·446	23·012
4	Aftern., dull .	20·743	2·475	23·218
7	Morning, sun	20·844	1·934	22·778
12	Noon, sun . .	21·032	1·762	22·794
4	Aftern., sun .	21·246	2·098	23·339
			Mean . . .	23·085

OLD HUSKS.

11	Night	19·297	2·942	23·239
7	Morning, dull	20·166	2·509	22·775
12	Noon, dull . .	20·626	2·461	23·087
4	Aftern., dull .	20·595	2·475	23·070
7	Morning, sun	21·139	2·316	23·455
12	Noon, sun . .	21·246	2·106	22·342
2	Aftern., sun .	20·676	2·107	22·783
			Mean . . .	22·965

Observations on these Tables.—1. These numerical results demonstrate that the air of the husks is much more rich in carbonic acid than atmospheric air.

2. They demonstrate, in a striking manner, that the quantity of carbonic acid is greater at night than in the day; and if we take the two extreme examples, that of eleven o'clock at night (2·746), and that of the moment when the light presents its maximum of intensity (1·419), it is evident that the proportion is as large again in one case as in the other.

3. These tables, in giving as a point of departure the examples of the night, also enables us to follow the progressive diminution of the carbonic acid, until the moment when it seems to stop. It is thus evident that the decomposing force of light increases with its intensity and the duration of its action; or that the hours of the same day, fine or dull, be followed, or that the results given by an entirely cloudy sky, be compared with those furnished by a burning sun.

4. It is also remarked that, with respect to the age of the husks, the reduction of carbonic acid is in ratio with the force of vegetation.

5. As a proof of the very limited permeability of the carpellary leaves of the bladder-nut tree, we refer to the column of oxygen where it is seen that the proportions of this gas increase in the fruit in proportion as the carbonic acid is decomposed in it: the relations which exist between the carbonic acid disappeared and the increased quantity of oxygen are precisely such that this increase of oxygen may be regarded as arising from the acid, which, in being decomposed, yielded its carbon to the plant.

6. We may remark, besides:—1st, that by uniting the oxygen with the carbonic acid, we obtain on the average 23; 2nd, that the carbonic acid always displaces nitrogen, and sometimes a little oxygen; but this latter case exists only when the proportion of carbonic acid is great, as the first example of each series indicates.

The experiments of Hennebier and De Saussure, and those of Dumas, Boussingault, and Liebig, demonstrated the fixation of carbon by vegetables; *but we may be inclined* to make known, by these results, the mode of action which light exerts in this reduction, which begins with the crepuscle and continues in the day in diffused light; which does not agree with the ideas concerning the fixation of carbon, admitted only in the case in which the plant was directly struck by the rays of the sun.

The third chapter of our memoir comprises the chemical examination of the air contained in the interstices contained in a certain number of hollow stems, collected in full vegetation, and whose gas we immediately passed under bell-receivers filled with mercury. In the manipulations necessary for this work, we carefully avoided all circumstances calculated to cause a mixture of the air of the stems with the external air.

The gases obtained and dried, like those of the husks, by sulphuric acid, gave us, with caustic potassa and eudiometrical experiments, the following results:—

TABLE OF THE QUANTITIES OF CARBONIC ACID IN VOLUME.

Name of the Plants.	Experiments of the Night. Carb. Acid per cent.	Experiments of the Day. Carb. Acid per cent.	Increase of Carbonic Acid in the Night.
Heraclium sphondylium	. . . .	1·408	. . . .
Angelica archangelica	2·587	1·766	0·815
Ricinus communis	3·078	2·721	0·347
Dahlia variabilis .	3·133	2·881	0·252
Arundo donax . .	4·619	4·407	0·212
Leicesteria formosa	2·879	2·267	0·612
Sonchus vulgaris .	. . . .	2·326	. . . .

QUANTITIES OF OXYGEN IN VOLUME.

Heraclium sphondylium	. . . .	19·653	. . . .
Angelica archangelica	20·364	19·784	0·580
Ricinus communis	18·656	16·876	1·780
Dahlia variabilis .	18·823	18·119	0·704
Arundo donax . .	18·691	18·193	0·498
Leicesteria formosa	19·137	18·703	0·434
Sonchus vulgaris .	19·774	17·971	1·803

1. From these tables it results that the air confined in the stems has a peculiar composition, very different to that of atmospheric air, as is indicated independently of the oxygen, by the great quantity of carbonic acid,—a quantity which increases with the force of the vegetation.

2. It results from this explanation that the quantity of carbonic acid is greater in the night than in the day, but the difference is far from being so great as in the case of the husks. This second fact may, in our opinion, be explained by this circumstance, namely: that the whole stalk, the descending and ascending caudex, and the roots contribute to absorption, whilst the diminution is produced only by the ascending part of the caudex, whose surface is exposed to the decomposing action of light.

3. We may also observe that in the stalks the oxygen increases in the night with the carbonic acid, which is contrary to what we noticed with respect to the husks.

The importance of ammonia has lately been put beyond doubt by the learned investigations of Dumas, Boussingault, and Liebig; but a passage in the *Essai Statique Chimique des êtres Organisés* of M. Dumas, having given rise to some doubt in our mind on this subject, we thought that it would be interesting for science to ascertain whether the ammonia of the air contributes directly to the presence of the nitrogen combined in plants, and we think that we have demonstrated this fact in a certain manner, by discovering ammonia in the gaseous state in the air contained in vegetables.

DETERMINATION OF THE AMMONIA ESTIMATED IN THE STATE OF DOUBLE CHLORIDE OF PLATINUM AND AMMONIA.

Quantities of Gas employed.	Name of the Plants.	Period of the Experiments.	Quantities of Double Salt.
555	Leicesteria formosa	Night	0·0080
360	*Idem* *Idem*	Day	0·0150
330	Arundo donax . . .	Night	0·0060
370	*Idem* *Idem*	Day	0·0085
1170	Ricinus communis .	Night	0·0100
1160	*Idem* *Idem*	Day	0·0120
940	Phytolacca decandra, with fruits . .	Night	0·0070
1140	*Idem* *Idem*	Day	0·0155
940	Phytolacca decandra, with and without flower . .	Day	0·0250
1650	Intermediate husks	Night	0·0970
473	*Idem* *Idem*	Day	0·0050
		Total . .	0·1890

—*Chemist.*

ABSTRACT OF A LECTURE ON CHEMISTRY, AND ITS APPLICATION TO PHARMACY.

By Thomas Griffiths, Esq.,
Lecturer on Chemistry and Medical Physics at St. Bartholomew's Hospital.

Mr. Griffiths commenced by observing, that the art of preparing those substances which operate powerfully upon animal bodies, and which, according to their different modes of exhibition, are either efficient remedies or active poisons, is purely chemical; and that the want of an acquaintance with scientific principles in the processes of pharmacy has often been productive of dangerous consequences.

So vast and so varied are the objects of experimental chemistry that it is exceedingly difficult to furnish a concise and correct definition of the science; but for the subject of the present lecture he might state, that chemistry is a science which teaches us that there are certain forms of matter called *elements*, which can unite with each other to form *compounds*, and that these compounds of *two* or *more* elements, can unite with each other to form *complex compounds*; the direct union of two or more elements being called a *primary compound*, and the union of two or more primary compounds a *secondary compound*.

Chemistry investigates the laws which affect, and the powers which control, these primary and secondary combinations, and determines the proportions by weight in which they ensue: it also discovers methods of separating all known compounds into their elements, and endeavours to apply such knowledge to useful practical purposes, in various departments of science and art. From the foregoing statement it appears that the main object of chemistry is to ascertain the composition, or the elements, of the varied forms of matter by which we are surrounded; and accordingly the lecturer proceeded to state the sense in which the term element is accepted in modern science. For example, if the chemist subject the

metal lead to numerous trials and experiments, with the view of discovering of what things it consists, he finds that he is baffled, and can gain no information regardiug the matter; accordingly he is compelled to call the metal a rudiment, a pure or simple substance, or an element; meaning only by the term that he cannot succeed in proving it to consist of two or more substances, or, in other words, to be a compound.

If the ehemist subjects litharge to experiment, he soon discovers that he can determine of what things it consists, and therefore calls it, not an element, but a compound, a compound of the metal lead and the gas oxygen; and to denote this discovery, he calls lithargc oxide of lead.

Of what does oxygen consist, is the next question, and this cannot be answered; oxygen behaves like lead in refusing to confess its composition, and therefore is called an element.

The operation of discovering the elements of litharge, or of any other compound, is called analysis; and it is found that the elements so elicited, when presented to each other under certain conditions, will unite and form the original compound; this is called synthesis.

When elements elicited analytically combine synthetically, and form the original compound, the chemist is confident of having performed his experiments with accuracy; but with regard to organic substances, Mr. Griffiths remarked, there are strange insurmountable barriers to synthetical operations.

If the chemist take another well-known substance, viz.: white lead, and experiment upon it, he finds that he can analyze it, and obtain from it oxide of lead and carbonic acid; he therefore calls white lead a compound, and denotes its constitution in precise terms as a carbonate of oxide of lead.

Is carbonic acid an clemcnt or a compound? Analysis proves it to be a compound of oxygen and carbon; and of what does carbon consist? The chemist is silent; he cannot analyse carbon, and therefore must rank it with lead and oxygen as an clement. It is not difficult to separate white lead into oxide of lead and carbonic acid; and in the chemical laboratory these compounds are familiarly called proximate elements of the white lead, because they are nearest to the hands of the operator, and they will directly unite to reproduce the substance; but lead, oxygen, and carbon, of which oxide of lead and carbonic acid respectively consist, require great skill for their mutual separation, and even then cannot be analysed, and are therefore called ultimate elements, meaning elements elicited when the analysis of white lead is carried to the utmost extent practicable in the present state of chemistry.

By experiments of this nature, the chemist has gained the curious and important information (slightly noticed upon the threshold of this inquiry), that not only do elements unite to form compounds, *ex. gr:* lead and oxygen to form oxide of lead, and oxygen and carbon to form carbonic acid; but these compounds in their turn unite and produce a complex compound called carbonate of oxide of lead. Such is the meaning of the terms primary and secondary combination.

In this style the lecturer proceeded to place before the Society several experiments and models illustrative of the various points under discussion. He adverted to the voluminous list of fifty-five elements, which the chemist is compelled to acknowledge; and stated that, by their mutual admixture and combination, they formed that endless chain of natural and artificial productions, whose investigation may worthily engage the chemist for his lifetime in active employment, useful alike to himself and his fellow-creatures.

"The beauty and fascination of chemistry," said Mr. Griffiths, "consist in the constant appeal to experiment, and the utter impossibility of anticipating the result of presenting different substances to each other."

The meaning of the term chemical affinity was next explained, and its distinguishing feature stated to be, that substances when they combine lose their individual characters, and no means can separate them; and, although many experiments captivate by the brilliancy they display whilst affinity is proceeding, the chemist is not satisfied until he ascertains the definite weight of the elements concerned, and the compounds produced. The chemist makes a constant appeal to the balance: all his experiments of refined research are conducted by weight, and he finds that 104 parts, by weight, of lead will combine with 8 parts, by weight, of oxygen, to constitute 112 parts, by weight, of oxide of lead; and further, that these 112 of oxide of lead will exert affinity for 22 parts by weight of carbonic acid, to constitute 134 parts by weight of carbonate of oxide of lead. He acertains that, to constitute carbonic acid, 16 parts by weight of oxygen, exert affinity for and combine with 6 parts by weight of carbon. Pursuing his researches amidst the host of elements and compounds, he discovers that they all exert affinity for each other in definite weights, and that he has no power of forcing their affinity in any proportions that his will may suggest: hence arises the wonderful precision, the great beauty of the modern science of chemistry, and as the greater number of powerful medicines now employed emanate from the laboratory, a correct and extensive knowledge of the laws of chemical affinity, and of the definite weights in which it is exerted, becomes of the most vital importance in pharmacy; for without such certain information, founded on experiment, neither the preparation nor the exhibition of medicines can be successfully and safely conducted.

"These facts," continued the lecturer "regarding the weight in which elements and compounds combine, have been most laboriously and accurately studied during the last twenty years, and they are the foundation of a magnificent doctrine, called 'The Theory of Definite Proportions,' which has the most extensive and extraordinary bearings upon every department of chemistry and of pharmacy."

The general law upon which this doctrine rests may be thus stated:—whatever be the proportion by weight in which one body combines with another, it preserves the same relative proportion in its combination with all other bodies.

The chemist must fix a standard, with which to compare the other elementary and compound bodies. Hydrogen, the most attenuated form of all ponderable matter, being called unity, and from it deducing the weights of elements and their compounds, the chemist finds that their numbers are simple multiples of the standard unit, and, therefore, whole numbers. Such were exhibited in the diagrams to which the lecturer referred, and he stated that they might be called representative, proportional, equivalent, or more concisely atomic numbers; there is not the slightest mystery attached to them, as many students even tolerably well versed in chemistry are apt to imagine—they result from experiment, and the manner of ascertaining them was fully detailed.

The term atomic number, meaning the weight of a substance which enters into combination with any other substance, refers to the standard unit of hydrogen; thus, the number of lead is 105, of oxygen 8, of oxide of lead 112.

But in the vast circle of experimental chemistry, it is found that substances frequently combine in more than one proportion; and when such is the case, each succeeding proportion is a simple multiple of the first: thus, the number of carbon is 6, it combines with 8 of oxygen to form 14 of carbonic oxide, and with twice 8, or 16, of oxygen to form 22 of carbonic acid, and such 22 of carbonic acid combine with 112 of oxide of lead to constitute 134 of carbonate of oxide of lead.

Many beautiful illustrations were next selected from the compounds of mercury with oxygen, iodine and sulphur; and of those of nitrogen with oxygen, &c. The primary union of elements, and the secondary union of compounds, in definite weights, present all those extraordinary subtances which are of such surpassing importance in pharmacy and, in order to denote their actual composition with as much precision as possible, the chemist has framed a particular language, or nomenclature, the leading principles of which were next explained.

The meaning of the term incompatibility was then discussed; the production of solid precipitates from clear solutions; a general account of the operation of tests; the evolution of nitric acid from nitrate of potash and sulphuric acid; the production of hydrochloric acid from chloride of sodium and sulphuric acid was afterwards undertaken; and the strict line of distinction between educts and products was drawn and particularly insisted upon. At this stage of the lecture, the action of oxyacids and hydracids upon metals and their oxides, and the production of calomel and corrosive sublimate, were explained and illustrated by experiments, and cubical models, better calculated to impress facts upon the mind than mere diagrams. All these results of the union of elements, the interchange of ultimate and proximate elements ensue, with the greatest precision, and are amenable to the theory of definite proportions: it is thus that the pharmaceutist is enabled to obtain his medicines at all times of the same composition, and that the physician is enabled to put confidence in their exhibition as remedies for disease.

Mr. Griffiths then stated the investigation of the chemical habitudes and properties of organic matter to be more difficult than that of inorganic; but still the chemist shrinks not from the task, his duty being to ascertain the elements of the three kingdoms of nature. He finds that vegetable and animal matters all admit of analysis into proximate elements of the utmost utility, *ex. gr.:* gum, sugar, starch gelatine, fibrin, albumen, &c.: and discovers that the ultimate of these and all other organic compounds are probably only four in number, viz.: carbon, hydrogen, oxygen, and nitrogen—so that the diversified array of organized matter (as far as his humble knowledge goes) appears to result not from the union of a vast number of ultimate elements, but from that of the above four, in proportions only slightly varied.

All organic matter admits of ultimate analysis, but synthesis is out of question; present the ultimate elements to each other under every variety of circumstances—endeavour to excite their combination by the powers of light, heat, or electricity, they will not unite to produce the original organic matter from whence they were elicited.

The proximate elements which are separable from organic matter by various operations of chemistry, are of vast importance in pharmacy; for example: the various acids, oils, resins, &c., the vegeto-alkalies, or active principles of opium, of yellow and of pale bark, known as morphia, quinia, cinchonia, and their compounds with acids in definite proportions, constitute a splendid illustration of the importance of chemistry in its application to pharmacy. And though it be true that the amount or weight of the vegeto-alkalies educed, varies with the quality of the opium, bark, &c., yet when obtained they are of definite atomic constitution, and display their affinities with organic and inorganic acids with undeviating exactitude.

In conclusion, the lecturer adverted to the processes of crystallization, distillation, sublimation, calcination, and stated that there is scarcely a process in pharmacy which does not depend upon chemistry.—*Pharmaceutical Journal.*

PRESTAT'S ADHESIVE PLASTER.—The following composition is said never to crack, and not to inflame the skin:—Empl. diachyl. gum, 400 grains; purified rosin, fifty grains; tereb. venet., thirty-eight grains; are mixed together at a gentle heat, and then twelve grains of gum mastich and twelve grains of gum ammoniac incorporated, and the mass spread on linen. In winter, it is advisable to add ten grains more turpentine and twelve grains of ol. amygdal.—*Gaz. des Hop.*

PREPARATION OF CARBONATE OF POTASH, FREE FROM SILICA, FROM ORDINARY PEARLASH, BY PROFESSOR JUCH.—One pound of crude potash is dissolved in one pound of rain water, and four ounces of finely-pulverised vegetable charcoal added to it; it is left for twenty-four hours, being frequently stirred and then filtered. On evaporation and saturation with an acid, it will be found not to contain a trace of silica, which it is otherwise so difficult to remove.—*Journ. für Prakt. Chem.*

ON THE PRODUCTION OF A NEW AMIDE BY THE ACTION OF AMMONIA ON OIL AND FAT.

By M. P. F. G. Boullay.

I have often been occupied with the ammoniacal soap, whose imperfect production was daily operated under my eye, when, in 1829, I tried experiments with a direct object. I wished to study this kind of combination, to ascertain if there were any real and complete action, and if ammonia could, in these circumstances, be assimilated with other alkalis: some circumstances gave rise to some doubts in my mind on this subject.

I was supported, however, by the conclusions of M. Chevreul, who so clearly and successfully developed the phenomena of saponification, and so carefully studied the new bodies which result from it.

However, M. Chevreul limited his investigations concerning the ammoniacal soaps, and, admitting an analogy of reaction, he concluded that ammonia in the caustic state, and the basic carbonic, at the ordinary temperature, saponified fat only with much difficulty.

Alcohol, saturated with ammoniacal gas,* was an agent which I wished to apply to other uses: first, to compose a kind of transparent *Eau de Luce*, and to substitute it for the milky mixture for which so many formulæ have been given; and, again, to be able to present the volatile alkali aromatised with all kinds of essences without causing it to lose its transparency. This succeeded; but I discovered a new course to be followed for studying the action of ammonia on the volatile oils which undergo by time, in these mixtures, a peculiar and remarkable alteration.

I had the idea of saponifying olive oil by gradually adding it, at a temperature of from 64° to 68° F., in a corked flask containing ammoniacal alcohol. By agitation, a portion of the oil was speedily dissolved; I continued to add as much as could be absorbed. The liquor retained its transparency, acquired a yellow tint, and was left in this state.

During the following winter I remarked silky crystals deposited in the flask, but they were so light, and in such small quantity, that I neglected to collect them.

On the other hand, in order to try the saponification by a different means, I exposed fat, whose fluidity was maintained at a gentle heat, to the action of a current of ammoniacal gas. This operation was connected with the preparation of volatile alkali for my shop. The fat, although melted, acquired opacity, but it did not present the characters of a true soap; it was kept in a sealed flask, and left thus for a great number of years, as well as the ammoniaco-alcoholic solution of olive oil, which, in summer, resumed its transparency, and, in winter, again deposited the white and crystalline matter which I have mentioned.

I placed olive oil in the same condition as the fat; the mixture became of a perfect dead white. Finally, I likewise set aside a mixture of equal parts of olive oil and liquid ammonia.

These products and many others were left to themselves, because, being occupied with other subjects, I had entirely left off working in the laboratory, retaining, however, the elements of a host of investigations formerly commenced.

I endeavoured, some months ago, to resume this work, being struck with the appearance acquired by the mixtures in question, all of which had undergone an action which time seemed to have rendered as complete as it was possible to hope for.

I should not, doubtless, have dared to make this new attempt in the progressive field of science, if my excellent friend, M. Dumas, to whom I had presented my products and submitted my views, had not encouraged me and promised to guide me in the delicate experiments, and particularly in the elementary analyses which my work required, and which were made under the supervision of that chemist.

* 1,500 grammes of alcohol at 30° absorb about one-third of their weight of ammoniacal gas. I have not remarked any reciprocal action between these two agents.

OIL SOAP.

The ammoniacal soap, that is to say, the compound resulting from a current of ammoniacal gas through olive oil, or that which results from the solution of the oil in ammoniacal alcohol, or even the simple mixture of oil and liquid ammonia, kept since 1829, in stoppered flasks, was of a perfect white.

Its reaction is alkaline; this property is lost when it it is exposed to a temperature of about 86° F., until the ammoniacal odour is entirely dissipated. The matter then gives signs of acidity.

It mixes in cold water without being dissolved in it. It completely and very easily dissolves in boiling alcohol. There is deposited, by cooling, a silky matter, crystalline without any well determined form, white and transparent, unctuous and soft to the touch, which, collected on a filter and well washed with distilled water, was neither perceptibly acid nor alkaline.

The alcoholic mother-liquor was slightly yellow and acid. It contained, besides a new quantity of neutral matter, fatty acids, more soluble in cold alcohol, an organic acid (not fatty) which appears new, glycerine, and a yellow colouring matter.

If the intact soap be boiled with thirty or forty times its weight of distilled water, the liquor becomes milky, and foams like a true solution of soap. After cooling, a matter of the appearance of fat or wax is collected and congealed on the surface; it is slightly acid; still potassa disengages from it traces of ammonia.

The ammoniacal soap, thus washed with warm water, was treated by boiling milk of lime; a lime soap was formed, from which alcohol removed the white crystallisable and neutral matter above mentioned. In this case it still retains traces of margarate and oleate of lime, which must be separated by successive crystallisation.

The most simple means of obtaining this new principle, completely free from extraneous matters, is to produce it by the slow action of ammoniacal alcohol on the oil. On afterwards concentrating the liquor, or simply exposing it to artificial cold, it allows silky crystals to deposit, which may be purified by redissolving in alcohol, and by recrystallising them; then all the other products of the reaction are found in the alcoholic liquor.*

The filtered decoction is acid; lime and potassa disengage ammonia from it; it is reduced by evaporation into a yellow, syrupy liquid, which redissolved in alcohol at 90°, yielded to it, besides glycerine and the colouring matter, a super-salt composed of ammonia and the peculiar acid already mentioned, which crystallised by cooling.

FAT SOAP.

The ammoniacal soap resulting from the action of a current of gaseous ammonia through pure lard kept in fusion, and, like the foregoing, made in 1829. Kept in a flask, simply corked, its colour was fawn yellow, and its consistence intermediate between fat and suet; it reddened litmus paper; potassa and lime developed ammonia. A portion of the ammoniacal fat soap was decomposed by a very dilute solution of oxalic acid, in slight excess, and heated; the fatty body which separated, cooled, and washed several times with boiling distilled water, was afterwards dissolved in alcohol with heat. By the cooling of the alcohol, a confused crystalline mass was formed, of still impure fatty matter, but entirely similar, when deprived of fatty acids, to that which we have already described.

By water and long-continued boiling, the fat soap melted into a sort of deep yellow oil, and ammonia evaporated. A portion of this fixed matter, collected from the decoction, well washed, treated directly by alcohol, gave the same results as that which was treated by an acid. The new fatty body may therefore be directly obtained like oil, with the exception of removing from it, by baryta or lime, the organic acids which accompany it, and which are found but in small proportion.

As to the decoction, it was much more coloured and more acid than that of the oil soap; by evaporation to dryness, and afterwards treated by alcohol, it was extracted, and in greater proportion than in the soap of oil; first, the same organic acid (not fatty), precipitating acetate of lead and nitrate of silver, but not lime and baryta water. This acid differs from sebacic acid, which it resembles, but with which I cannot absolutely compare it; second, the yellow colouring matter, also more abundant; third, much glycerine.

At the same time that I discovered this new principle in the ammoniacal soaps, M. Lassaigne, on his part, met with it in the old ammoniacal liniments of the veterinary pharmacy of Alfort. He immediately availed himself of it for trying a process for detecting the presence of nitrogen in organic matters. M. Lassaigne, not having been able to follow with me the chemical examination of this body, which was connected with a general and long commenced work, the further study of it was reserved to me. I therefore sought to characterise it, and to determine its nature, in order to assign to it, among the products of the organic kingdom, the place which it ought to occupy.

This matter, obtained pure, then melted and dried in the sand-bath, submitted to analysis, by means of oxide of copper, gave the following results:—

ORGANIC ANALYSES.

		Water.	Carbonic acid.
A. 0·761	of matter furnished	0·895	2·112
B. 0·792	,, ,,	0·9195	2.202

ESTIMATION OF NITROGEN.

		Cubic centimetres.	Temperature.	Barometer.
A. 0·470	matter	21·5	54·5° F.	0·751
B. 0·450	,,	20·5	55·0° F.	0·750

Which furnishes per cent:—

	According to analyses. A.	B.	According to the formula.
Hydrogen	13·05	12·88	13·0
Carbon	75·63	75·81	75·8
Nitrogen	5·33	5·31	5·2
Oxygen.	5·99	6·00	6·0
	100·00	100·00	100 0

A result which agrees perfectly well with the formula in equivalents:—

$$C^{134}\ H^{33}\ O^{2}\ (N\ H^{2}),$$

representing margaramide—that is to say, margarate of anhydrous ammonia, minus I equivalent of water, furnished by the combination of 1 equivalent of the hydrogen of the ammonia with an equivalent of the oxygen of the margaric acid.

Margaramide is a white, solid substance, unalterable in the air, perfectly neutral, insoluble in water, very soluble in alcohol and ether, especially with heat. These solvents abandon a portion of it by cooling, under the form of crystalline needles, if the crystallisation be slow and the liquor not too concentrated, or white translucid plates if the separation be sudden.

It is fusible at about 140° F., and burns, like fatty matters, with a fuliginous flame, without leaving any charcoal.

The dilute solutions of potassa, soda, lime, and baryta do not alter it; they act on it only when they are concentrated and boiling; ammonia is then disengaged, and a salt remains which presents all the characters of a true soap.

The acids act on margaramide only at a certain degree of concentration, and more actively by aid of heat.

Without heat, weak sulphuric acid seems to unite with margaramide, and the mixture assumes the appearance and consistence of a cerate. When concentrated, the same acid imparts to it a rose colour. At 212° the solution is operated, and

* Heat is a powerful auxiliary, which it is difficult to apply to the preparation of margaramide. I have produced this new body by mixing one part of oil or fat with fifty parts of liquid ammonia, and stirring the mixture frequently. This means is not more prompt than by the reaction of ammoniacal alcohol; it would be more simple and more economical.

the colour acquires intensity. The whole assumes the form of a mass by cooling.

Nitric acid, cold, is without apparent action; by boiling, it disengages nitrous vapours—the liquor froths and swells up. On cooling, the matter which has not been destroyed, collects on the surface; it has a pearly aspect, and its consistence is increased.*

Most of the fixed oils and fats are susceptible of undergoing, by the action of ammonia, the same kind of transformation. For example; oil of sweet almonds, put into ammoniacal alcohol, furnishes, in less time than olive oil, a greater quantity of magaramide.

Oil of colza, made cold and pure, the oils of walnuts and hazelnuts, are more difficult to decompose under the same influence, but they undergo it very well in a long time. The oil of white poppy seeds dissolves better than the foregoing in ammoniacal alcohol, communicating to it a very deep yellow colour. At the end of a certain time, the bottom and the sides of the flask are covered with margaramide, and much oleïc acid is found in the liquor. Linseed oil acts in an analogous manner; these two kinds differ, as is known, in the properties of the oleïn which constitutes them.

There is an oil of a very peculiar nature, on which an analogous action is exerted, in a very marked manner. Castor oil dissolves in almost all proportions in ammoniacal alcohol. It is sufficient to leave to itself, for some days, a mixture of equal parts of these two liquids, for the operation to be effected; the liquor, in this short space of time, acquires a yellow tint, and, either by spontaneous evaporation, to one-fourth, or by artificial cooling, there separates an abundance of a substance of a dead white, of an imperfect and confused crytallisation, which, when it is well washed, resembles margaramide in its essential characters. It has less consistence; it is more fusible and more soluble in alcohol and ether. The mother liquor from which it is separated, of a fine yellow colour, contains, doubtless, ricinate and oleidate of ammonia, glycerine, and colouring matter. I consider this body as peculiar, and that it should be amide and ricinic acid. I have not yet been able to make the experiments necessary for proving it.

The volatile oils also undergo remarkable alterations when submitted to the action of ammonia. The effects of this alkali on the essences of cinnamon and cloves, observed by M. Bonastre, and since confirmed by M. Dumas, are already well known; as also are the results obtained by MM. Dumas, Pelouze, and Cahours, with those of mustard, bitter almonds, and *gaultheria procumbens*.

The odour of essence of mint and that of ammonia are neutralised by prolonged contact. The mixture is turbid, and, after a long time, a flocculent matter is precipitated. By their mixture with this alkaline base, several others, that of tarragon among the number, lose all oily quality.

Essence of turpentine seems to have, in the principal point of view of this work, the greatest analogy with the fixed oils; it likewise assimilates a portion of the elements of ammonia, and there results, perhaps, an amide of a peculiar nature; at all events the phenomena which are produced deserve to be carefully studied.

The formation of margaramide presents the first artificial amide arising from fatty matters. It is connected with a theory already professed for some years by M. Dumas concerning the natural amides extracted from vegetables, such as the organic alkalis, which would result from the action of nascent ammonia on acids pre-existing to their formation, and belonging, probably, for the most part, to vegetable oils.

The following, on this subject, occurs in the work of this celebrated chemist, vol. v., page 728, *et seq.*:—"Only one of the elements of organic alkalis—nitrogen—appears constant, and it is worthy of remark that its quantity is precisely that which would exist in an equivalent of ammonia: it might be thought, according to that, that these bases contain ammonia, and owe to it their alkaline characters; but this opinion cannot be correct; for it would require that the ammonia should be combined with another body, and that, however, it should not lose its own capacity of saturation, which could not be. Ten years ago, in my lectures, I compared the organic alkalis to urea, and I see no reason for changing this view. Like them, urea forms definite salts; it presents an analogous composition, and perhaps an analogous capacity of saturation. I should therefore be inclined to regard the organic alkalis as amides, resulting from the action of ammonia on acids pre-existing to their formation. We are now acquainted with neutral amides and acid amides; nothing is opposed to the formation of basic amides."

From the facts laid down in this memoir, I think I am authorised in concluding—

1st. That the action of ammonia on oils and fats is in general slow and difficult; because it cannot be aided by a high temperature, and because it can be completely operated only at the end of several months.

2nd. That there results from it, in very small proportion, margarates and oleates, a peculiar acid in the state of super-ammoniacal salt, glycerine, and a colouring matter; but more particularly an entirely neutral body, having all the characters of an amide, and presenting the composition of *margaramide*.

3rd. That castor oil, in particular, is almost entirely converted, under the influence of ammonia, into a neutral body, analogous to that which the other fixed oils furnish, but with different characters.—*Journal de Pharmacie*, and *Chemist*.

* If we could form margaramide abundantly by an economical process, and if it were wished to introduce into therapeutics, or into the arts, this peculiar fatty body, it would present a superior consistence to fat, and inferior to *suet* or wax, precisely what is desired for liniments or ointments: it has also the advantage of turning rancid less easily than analogous substances.

PATENT.

Patent granted to Claude Edward Deutsche, London, for Improvements in combining Materials to be used for Cementing Purposes, and for preventing the Passage of Fluids, and also for forming or constructing Articles from such Compositions of Materials.

The invention consists in a mode of treating bituminous substances, and combining them with other matters, so as to render them applicable to the various purposes now to be described.

The foundation of the invention is the use of combustible bituminous substances—such as bitumen, asphalte, pisasphate, mattes, mineral caoutchouc, and the produce of the distillation of coal. To operate upon these matters, the patentee takes a certain quantity of bituminous substance, (bitumen of Trinidad is preferred), and places the same in an ordinary distilling vessel; after closing it, heat is applied to it until the essential oil and water which is contained in the bitumen has been given off in vapour, which vapour will be condensed by its passing through an ordinary condenser, which is surrounded by cold water. When it has arrived at that stage that the condensed water, &c., comes away only in small drops, the bitumen under operation should be removed from the vessel, and passed through a metallic cloth sieve, arranged at the upper part of a basin, containing water, and then the whole brought to a temperature of 122°, Fahr. It may then be removed, and made into any form required.

Second Preparation.—Add to the matter above prepared from 1 to 50 per cent. of protoxide of lead, or of any other oxide, and mix them well together, by which an infusible substance is obtained, more or less so in proportion to the quantitity of the metallic oxide that is put in.

Third Preparation.—Take a quantity of the material, prepared as described in the first preparation, and after having driven off by heat all the essential oil and humidity contained in it, then add from 1 to 20 per cent. of oil, reduced almost to a state of dryness by the addition of a quantity of litharge, or any other metallic oxide; then add a sufficient quantity of essential oil of turpentine, or other essential oil, until it is brought into the state or consistency of ordinary paint.

Fourth Prepartaoin.—Add to a quantity of the first preparation a sufficient quantity of oil of turpentine, or other oil, to bring it to the consistency of ordinary paint.

Fifth Preparation.—Add to a quantity of the first preparation from 1 to 100 per cent. of fatty matters (the patentee prefers concrete whale oil), by which the fusibility of the substance will be more or less increased in proportion to the quantity of fatty matters that are put in. By adding to these different preparations a quantity of wax, gum resin, resin, sulphur, or cautchouc, a flexibility and adhesive property is obtained, more or less according to the quantity of such matters employed.

Sixth Preparation.—To make a brilliant black (brown) varnish, the bitumen should be well heated until it is brought into a liquid state, and then passed through some very fine heated seives; then from 1 to 100 per cent. of gum resin or resin added, and the whole mixed well together, placed again on the fire, and left there until the whole of the essential oils and humidity have been evaporated, when spirits of oil, or essential oil of turpentine, or other oils, are to be added to bring it into the required consistency for use; ivory black, or other colouring matters, may then be added in a powdered state. If resin lac is used, it must be dissolved in alcohol, and added to the prepared bitumen, as explained in the fourth preparation. The bitumen thus purified, and mixed with resin and resinous gums, will be found to be capable of being made into a very good sealing-wax.

Seventh Preparation.—Take a quantity of the first preparation, and add to it a quantity of either one, or several, vegetable products, such as caoutchouc, bdellium, copal resin, lac, or elemi, or gum resin, or other resin, and add thereto a suitable quantity of any essential oil or alcohol, or even oil and alcohol mixed together. The adhesive nature of these preparations will be more or less increased in proportion to the quantity of gum or resin which is put in. The first of these vegetable products, with the addition of a considerable quantity of oil or alcohol, may be usefully employed to render tissues, wood, and leather impermeable. The last of these vegetable products, by the addition of a large quantity of resinous matter, will make a good cement for cementing stones, metals, and wood used in the construction of vessels.

In preparing matters for cementing purposes, the oil of naphtha (crude naphtha), obtained by distillation from bitumen, or coal mixed with a portion of alcohol, is the most preferable to be used, and the resin or gum resin that is preferred is the resin lac in sheets, as being of the most adhering nature.

The following is a list of preparations for cementing purposes, where the distilled bitumen may be added in quantities of from one to one hundred per cent.:—

1st. Take one part of oil or alcohol and two parts of resin lac, or any other resin, and melt them over the fire, keeping it well stirred up. For joining anything together, this is applied over the surface of the articles to be joined with a hard brush, taking care that all the surface is covered; heat is then applied until the cement is in a liquid state, when the articles to be joined together are placed one over the other and pressed together, and allowed to remain under pressure until the cement is cold.

2nd. Add one part of oil or alcohol with one part of bdellium, and melt them together over a fire; then add one part of resin lac, or other resin, and heat it as before explained in No. 1.

3rd. Dissolve in water one part of gelatine and one part of oil or alcohol, with one part of resin lac; mix these products well together over the fire untill they are well amalgamated, and then use them as explained in No. 1.

4th. Add to one part of bdellium two parts of gelatine dissolved in water, and one part of oil or alcohol, and heat them together until they are well mixed; then add two parts of resin lac dissolved in one part of alcohol, mix the whole

together, and and employ the preparation as explained in No. 1.

5th. Melt two parts of resin lac or other resin with one part of styrax, and apply it as before.

6th. Melt two parts of resin lac in one part of turpentine, and apply it as before.

7th. Take one part of liquid styrax or turpentine, and add four parts of resin lac and one part of oil or alcohol, and mix the whole together and apply it as before.

8th. Take one part of liquid styrax or turpentine, one part of alcohol, and two parts of resin lac, and add to it two parts of gelatine dissolved in water, and mix the whole together and apply it as before.

To all these preparations a proportion of caoutchouc may be added to the oils to give flexibility to them, and from one to one hundred per cent., in proportion to the quantity of flexibility required.

The 1st, 2nd, 5th and 7th of the above-described preparations will be found more particularly applicable for caulking vessels that trade to those countries situated between the tropics; also in constructing of steam-boats it may be usefully applied to those parts which are near the fire-place and boiler; also for stopping the cracks in masts, yards, and sides of ships; it may also be used as a cement for joining stone, wood, and metals, for covering them in order to preserve them; also every description of linen, paper, leather, &c.; for making sealing-wax, and for forming subterraneous passages for water, for luting parts of steam-engines and chemical vessels; it may be formed into roofs, gutters, and tubes of every description, for the passage of gas and other fluids; to form statues, vases, and other architectural ornaments. It may also be employed to preserve provisions, by coating the vessels containing them in such a manner as to exclude the atmospheric air.

The preparations described as the 3rd, 4th, 6th and 7th may be applied to painting purposes; they will be found particularly applicable to the preservation of steel, iron, and other metals; for wood, linen, and any other description of article that may be exposed to damp.

The 5th preparation will be found particularly applicable to rendering leather impermeable; also for the caulking of ships.

With regard to this latter application, care must be taken in the preparation, that when the vessels go to hot climates there be a decreased quantity of fatty matters put therein, and a greater quantity when they go to cold climates.

The 1st, 2nd, 5th and 7th, when combined with the dust of stones, wood, coal, scoria, or the filings of metals or their oxides, may be employed to form walls, statues, vases, &c. &c.

In employing the 3rd, 4th, 6th and 7th preparations, varying the proportions as may be required, articles of linen, and waxed or varnish papers may be manufactured for their impermeability of leather, of linens, also for the preservation of wood, vegetable, and mineral substances, and all matters which become injured by damp.

From the essential oils obtained in the distillation of the bitumen the naphtha contained therein is extracted, which has been for a long time employed for medicinal purposes; this naphtha will be very pure, and in quantities greater those obtained from pitch.

To preserve substances from decay caused by worms, and other insects, it will only be necessary to cover them with a coating of any of the above products mixed with a portion of any poisonous matter, which will effectually prevet their ravages, —Sealed Oct. 8, 1842.

Test for Arsenic.—Dr. Baumann recommends, for detecting small quantities of arsenic, triturating the suspected body with from three to six times its volume of iron filings, which have been exposed to a red heat, and are known to be free from arsenic, and heating the mixture on charcoal in the reducing flame of the blowpipe. Even with the smallest quantity of arsenic, the odour at least is disengaged.—*Archiv der Pharm.*, and *Chemical Gazette.*

IMPROVEMENTS IN COATING GLASS WITH SILVER FOR LOOKING-GLASSES, ETC.

Patent Granted to Thomas Drayton.

A mode of silvering glass, for looking-glasses and other uses, without the employment of quicksilver, constitutes the subject of this patent: it consists in depositing silver, from a solution, upon glass, by de-oxidising the oxide of silver in solution, in such a manner that the precipitate will adhere to the glass, without the latter having been coated with metallic or other substances.

A mixture is first made of one ounce of coarsely-pulverised nitrate of silver, half an ounce of spirits of hartshorn, and two ounces of water; which, after standing for twenty-four hours, is filtered (the deposit upon the filter, which is silver, being preserved), and an addition is made thereto of three ounces of spirit (by preference, spirit of wine), at 60° above proof, or naphtha; from twenty to thirty drops of oil of cassia are then added; and, after remaining for about six hours longer, the solution is ready for use. The glass to be silvered with this solution must have a clean and polished surface; it is to be placed in a horizontal position, and a wall of putty, or other suitable material formed around it, so that the solution may cover the surface of the glass to the depth of from an eighth to a quarter of an inch. After the solution had been poured on the glass, from six to twelve drops of a mixture of oil of cloves and spirit of wine (in the proportion of one part, by measure, of oil of cloves to three of spirit of wine) are dropped into it, at different places; or the diluted oil of cloves may be mixed with the solution before it is poured upon the glass. The more oil of cloves used, the more rapid will be the deposition of the silver; but the patentee prefers that it should occupy about two hours. When the required deposit has been obtained, the solution is poured off; and as soon as the silver on the glass is perfectly dry, it is varnished with a composition formed by melting together equal quantities of bees-wax and tallow. The solution, after being poured off, is allowed to stand for three or four days in a close vessel; as it still contains silver, and may be again employed after filtration, and the addition of a sufficient quantity of fresh ingredients to supply the place of those which have been used. The patentee states that, by experiment, he has ascertained that about eighteen grains of nitrate of silver are used for each square foot of glass; but the quantity of spirit varies somewhat, as its evaporation depends upon the temperature of the atmosphere, and the duration of the process.

If the glass be placed in an inclined, or even a vertical position, and the surface covered over, leaving a narrow space for the solution between the surface of the glass and the cover, which fits close, then, by using spirit without water in the mixture, the object will be accomplished. By the addition of a small quantity of oil of carraway or thyme, the colour of the silver may be varied. The oil of cassia, purchased of different manufacturers, varies in quality; therefore if, on being mixed with the solution, it should become flaky, the solution must be filtered previous to use.

The patentee, in concluding his specification, says that he does not confine himself to the precise details herein described, provided the peculiar character of the invention be retained, whereby silver is deposited on to glass from a solution of that metal, by de-oxidation, in such a manner as to cause the silver to adhere to glass, without any previous coating of the latter.—*Newton's Journal.*

The Artesian Well near Paris.—The volume of water supplied by the Artesian well of Grenelle was measured a few days ago, and found to have lost nothing of its force or quantity. The source furnishes 2,000,000 quarts of water per 24 hours, which is more than sufficient for the consumption of the quarter of the Pantheon, where immense reservoirs have been constructed to receive it. The water is as limpid as filtered Seine water, and has continued clear since tubes have been inserted in the aperture.—*Polytechnic Review.*

LIEBIG ON THE CAUSE OF THE ACIDITY OF HUMAN URINE.

Direct experiments show that fresh urine, of a strongly acid reaction, and taken from various healthy individuals, when cautiously neutralized with water of barytes, does not retain in solution the least trace of barytes. Now, as lactate of barytes is readily soluble in water, the urine would certainly, and of necessity, contain barytes, if its acid reaction were really owing to the presence of lactic acid. Upon the addition of the first drop of the barytic water to urine, an extremely copious precipitate is formed, which consists of urate and phosphate of barytes and lime; but no detectable trace of barytes is found, even although only just so much barytic water is added as to leave the urine still possessing a feebly acid reaction. Carbonated and calcined magnesia act upon urine in precisely the same manner. If either of these substances be mixed with water, so as to form a milky fluid, and then be added to an acid urine, the acid reaction will immediately cease, and a very copious white precipitate be formed. The fluid now manifests a feebly alkaline reaction, and contains a trace of magnesia in solution. It is a remarkable circumstance that magnesia withdraws the phosphoric acid from the urine so completely, that a mixture of perchloride of iron and acetate of potash no longer indicates a trace of phosphoric acid in the urine which has thus been treated with magnesia. Prof. Liebig also instituted direct experiments to detect lactic acid. These were made upon putrid urine, because lactic acid is not destroyed by putrefaction, and must therefore, of necessity, be present in putrid urine if it really forms a constituent of fresh urine. The experiments of Berzelius on this point do not, any of them, amount to a positive proof that lactic acid really forms a constituent of fresh urine. Liebig's mode of proceeding for the detection of lactic acid was the following:—Putrid urine was evaporated to dryness in a water-bath; the residue treated with a mixture of alcohol and sulphuric acid. The fluid obtained was saturated with oxide of lead, then filtered to separate the phosphate, sulphate and chloride of lead formed; the lead contained in the filtered liquid was separated by sulphuretted hydrogen. The solution, which would have contained lactic acid had there been any present, was evaporated in a water-bath, and the residue treated with alcohol; a quantity of common salt remained. The soda was removed from the alcoholic solution by effloresced oxalic acid at a high temperature; the oxalate of soda separated by filtration; the fluid was then saturated with oxide of lead, which again gave rise to the formation and separation of chloride of lead. The solution was again freed from lead by sulphuretted hydrogen, then concentrated in a water bath, and basic acetate of lead added in excess; a copious white precipitate was separated by filtration. The fluid must have contained the lactic acid had any been present in the urine; the lead in solution was separated by sulphuretted hydrogen, the fluid filtered, evaporated in a water-bath, and boiled with hydrate of barytes; a quantity of ammonia was evolved by this operation. After the decomposition of the ammoniacal salt, the new-formed salt of barytes was cautiously decomposed by sulphate of zinc, and every possible means was applied to obtain crystals of the lactate of zinc from the fluid, but without success; no trace could be discovered. The white precipitate obtained by means of the basic acetate of lead, contained hydrochloric acid and a brown resinous substance, which upon combustion comported itself like an animal substance. Other methods of analysis were adopted, but with no more success. The experiments were made upon from 40 to 50 lbs. of urine. All the experiments indicated the presence of an organic acid; but after the removal of all the inorganic acids and bases contained in the urine, this acid was proved to be a mixture of acetic acid with a brown, highly-nitrogenized, substance, which is a product of the putrefaction of the urine. Respecting the cause of the acidity of healthy urine, Liebig remarks, that the bibasic phosphates of soda and potash are,

in many respects, highly remarkable salts; although of a tolerably strong alkaline reaction, yet they exercise no destructive action upon the skin or upon organic formations. They possess all the properties of the free alkalies, without being such; thus they absorb carbonic acid, and this in such a manner that acids produce effervescence in a saturated solution of this kind, just as in alkaline carbonates. Hippuric acid dissolves with facility in water to which common phosphate of soda has been added; uric acid possesses the same property at a high temperature; the phosphate of soda, in this process, loses its alkaline reaction completely upon the addition of uric and hippuric acids, and becomes acid. The acid nature of the urine in man and the carnivorous and graminivorous animals is thus explained in a very simple manner.—*Chemical Gazette.*

ON THE EVIDENCE OF SCIENTIFIC MEN BEFORE LEGAL TRIBUNALS.

The opinions delivered by men of deep research in their own peculiar departments before legal tribunals, are daily becoming the theme of wonder and ridicule to the public at large. Scarcely is there a trial involving a great question, that ought to be solved by those who have studied the points connected with it most deeply, than there is a collision of evidence, amidst the mockery and the sneers of the barristers, whose object is, of course, to win the cause, and not to arrive at truth.

The conflicting testimony of medical men upon the subject of insanity, has tended to show that the judgment formed by persons of common sense, perfectly impartial, is quite as valuable, and as much to be relied upon, as the professional scrutiny of those who declare that they devote themselves to the examination and to the treatment of the insane. But medical evidence has unfortunately been long at a low ebb, and solicitors have every reason to believe that they can purchase it at graduated prices; and when we see the cases which have been subjects of the law courts, we cannot much be surprised at it. We find, for instance, such a trial as that which was brought by the widow of Mr. Kinnear, the banker, to recover £2,000 from the Rock Assurance Company, in which six medical men, two of them physicians, after a careful examination of the dead body, pronounced upon the cause of death; while, on the other side, surgeons of eminence, who had not that advantage, asserted that it must have been by poison, without assigning any other reason than that they were not satisfied with the opinions of the six other gentlemen.

We may possibly find some excuse for the difference of views upon subjects which are somewhat speculative, and that require rather the exercise of the reasoning faculties than of the senses; but what are we to say of the practical chemists of the day? who should take nothing for granted, who ought to be guided solely by experiment, whose manipulations should prove the truth of their views. Yet the opinion is now tolerably prevalent, that no reliance can be placed upon them, for we find their evidence upon matters of fact diametrically opposed to each other. We constantly observe in the daily press, that upon a trial, Professors A, B, C were for the plaintiff, and D, E, F were for the defendant; assuming as a fact that, that if subpœnaed by the plaintiff, D, E, F would have been his witnesses, and A, B, C those of the defendant, and that there had been a struggle not to arrive at truth, or to tell all that was known, but that the party who paid for the evidence was to have the benefit of everything that could be found in his favour, and all that appeared prejudicial was to be carefully kept back. At the same time, we are prone to believe that not one of these professors would be tempted by any sum to a deliberate falsehood; but they allow themselves to be biassed by their clients, they have taken up a one-sided opinion, and even should they, in the progress of their inquiries, find they laid hold of a wrong idea, they think they are bound in honour to go on in the path in which they have commenced their journey, and try to prove it to be the only one that leads to truth.

That carelessness—we must not call it ignorance—sometimes leads the public to undervalue the opinions of scientific chemists, we must concede. The late case at the Excise Office is an instructive one. We find two of the first chemists asserting, that in a certain liquid there is not the trace of spirits, and we find Dr. Ure showing by analysis that actually three-fourths of the fluid is spirit. A case has just occurred which has involved some very interesting questions, and two of our most distinguished chemists were employed, Dr. Ure and Mr. Phillips, against each other; and whilst it was a singular sight to see two such eminent men brought into collision with each other, each anxious to show the superiority of his own views, it led rather to the conclusion that science was a marketable commodity, which might be brought to assist those who could afford to pay her handsomely.

Mr. Brookes, the proprietor of an estate at East Cowes, in the Isle of Wight, had embarked a large sum of money in an extensive speculation for the building of numerous villas. He considered himself fortunate in having found brick-clay upon the property, and commenced the manufacture of bricks upon a large scale. He baked them in clamps instead of in kilns, which latter are preferred by most brickmakers, because there is less waste, less fuel consumed, and the bricks are sooner burnt. A clamp is thus formed: its foundation is of dried bricks just made, upon which the bricks to be burnt are built up tier upon tier; between each layer of bricks are two or three inches of cinders, from which the ashes have been sifted, and to which the technical term *breeze* is applied. The fire-place and its flues are constructed differently, according to the wish either to dry the bricks speedily or slowly. As the combustion goes forward, emanations and effluvia are, of course, given forth. Mr. Barwell, the proprietor of East Cowes Castle, who was the immediate neighbour of Mr. Brookes, found these vapours not only disagreeable to the senses, but laboured under the impression that they were highly destructive to the vegetation, and that they had most decidedly injured his plantations. He accordingly obtained an injunction from the Lord Chancellor against Mr. Brookes, the consequence of which was, the clamp was extinguished, and a most serious loss sustained.

Litigation having once commenced, it was carried on with most energetic decision by both parties. Chancery suits sprung from it, and, after various hearings on both sides, the Lord Chancellor referred it for arbitration to Mr. Swanstone, an eminent Chancery barrister.

Both parties seemed determined to carry on litigation regardless of expense. The proprietor of East Cowes Castle called witnesses to prove the injury his trees had sustained. As it has been a generally received opinion that the ordinary vapour from a brick clamp in action has no injurious effect, it was necessary to prove that there was some unusual circumstance attendant upon this clamp, and Professor Phillips gave evidence that the breeze employed by Mr. Brookes differed from that which is usually burnt, and that it contained sea salt; this becoming decomposed at a high temperature, gave forth hydrochloric acid, which produced the deleterious effect complained of.

This argument created considerable interest, and evidently much influenced the arbitrator. Dr. Ure, however, not only exposed the fallacy of the doctrine, but showed by actual experiment that the temperature was not sufficient for the evolution of the gas, but that from the clay ammonia was given out. The two learned chemists insisted upon these most contradictory opinions, and the arbitrator was sorely puzzled between them.

Botany was called in to lend its aid to solve the problem. Dr. Sigmond and Mr. Rogers gave it as their opinion that the trees which were declared to be destroyed were unhurt, and that their apparent unhealthy state was to be attributed to their exposure to the south-west blast, which has a striking influence on vegetation throughout the Isle of Wight. All evidence, however, was of little avail; the arbitrator could arrive at no decision after the big war of opinion of the chemists; he condemned each party to pay his own costs, and dismissed the case. Nearly £5000 have been spent, both parties are dissatisfied, the chemists are laughed at, and had the arbitrator gone down to the Isle of Wight on the day he gave his undecisive opinion, after six months' deliberation, he would have found the trees whose supposed decay had been the cause of the conflict, in full bloom and beauty, and the vegetation even more luxurious than it had been in former years.—*Polytechnic Review.*

ON THE ADULTERATION OF COFFEE, AND THE MODE OF DETECTING THE FRAUD.

Roasted and ground coffee is extensively adulterated by the grinders and retailers of this substance; and the public, we suspect, is scarcely aware of the great extent to which the practice is carried. We propose, therefore, in the present article, to point out the substances used for this purpose, and the mode of detecting them.

The principal adulterating ingredient is chicory. This is the dried, roasted, and ground root of a syngenesious plant, called by botanists *Cichorium Intybus;* better known, probably, to most of our readers by its English appellation of wild succory.

Two kinds of chicory are sold by dealers, the foreign and the British. Foreign chicory is the produce of Prussia, Belgium, and France, but is roasted and ground in this country. It is the most esteemed. British chicory is the growth of this country, but the roots produced in England are more woody, and less fleshy than those which are imported. They yield, when roasted and ground, a chicory powder, which has a paler colour than the foreign, and a more speckled appearance. Hence British chicory is of inferior value, and is usually coloured with Venetian red.*

But while the grocers, on the one hand, cheat their customers by adulterating coffee with chicory, the chicory-dealers in turn cheat the grocers by adulterating chicory. The substances employed in effecting the latter fraud are principally Hambro' powder and coffee flights.

Hambro' powder consists of roasted and ground peas, &c., coloured with Venetian red. The term coffee-flights is applied to the thin membranous coat (endocarp) which separates from the coffee-seed in the act of roasting.

Having now explained the nature of the substances employed in adulterating coffee, we proceed to point out a ready mode of detecting chicorised coffee from genuine coffee; premising, that by "chicorised coffee" we mean not only coffee which has been adulterated with genuine chicory (foreign or British), but also that which is mixed with spurious chicory, viz.: Hambro' powder.

If a little genuine ground coffee be thrown on a wineglassful of cold water, it for the most part floats, becomes very slowly moistened, even when shaken up with the water, and communicates scarcely any colour to the liquid. Very gradually it imbibes water, the liquid acquires a very pale sherry tint, and at the end of several hours the greater part of the powder is found to have fallen to the bottom of the glass.

If powdered chicory be treated in the same way, the phenomena are very different. It very speedily absorbs moisture, communicates a deep reddish-brown tint to the water, and in a few minutes falls to the bottom of the liquid. Foreign chichory yields a strong, dark, blood-red tint to the water. British chicory, coloured with Venetian red, gives a less deep, but rather more brown colour. Hambro' powder communicates a somewhat weaker colour than the last, but the tint is of the same kind. Owing to the presence of torrefied starch in Hambro' powder, the water, to which the latter has been added, acquires a deep purplish colour on the addition of a solution of iodine; whereas the water to which either coffee or chicory (British or Foreign) has been

* Venetian red is the sesquioxide of iron (obtained by calcining copperas), adulterated to suit the various prices of the market.

added, merely acquires a deeper reddish-brown tint, when a solution of iodine is mixed with it.

These differences in the action of water on coffee and chicory furnish us with a means of detecting chicory in ground coffee. Throw about a teaspoonful of the suspected coffee on a wine-glassful of water, and stir the mixture with a spoon. If the coffee be pure, the phenomena will be as above described for genuine ground coffee. If, however, it be chicorised, the presence of chicory (genuine or spurious) will be readily detected by a portion of the suspected powder rapidly sinking, and communicating to the liquid a reddish-brown tint, which will be more or less deep, according to the amount of chicory present. If the coffee be adulterated with Hambro' powder or roasted corn, we have a farther test in iodine, which communicates a purplish or bluish-red tint to the water to which either of these substances has been added.

The preceding test is sufficiently delicate and valuable, in all ordinary cases, for detecting chicory in coffee; but to those familiar with microscopic investigations, the microscope furnishes another mode of proceeding, fragments of dotted ducts being found in chicory, but not in pure coffee. They are not met with, however, in great abundance; and some patience and care, therefore, are requisite in searching for them. The starch grains of Hambro' powder are readily detected by the microscope, as also the blackening effect of a solution of iodine on them.

There is another substance which is sold for mixing with coffee, under the name of refining powder. It is a dark rusty-brown powder, intermixed with glistening scales. Its odour is that of caramel or burnt sugar, its taste is bitterish. Heated on the point of a knife over a candle or lamp, it fuses, swells up, evolves an inflammable gas, and leaves a coal which by incineration yields a whitish ash. Thrown on water, it almost immediately sinks, and communicates a dark-red colour to the liquid; and by these characters it may be detected in coffee. It appears to owe its most remarkable qualities to partially charred saccharine matter. A decoction of it when cold is unaffected by iodine, showing the absence of starch. It is bought by the keepers of coffee-shops principally. Half a teaspoonful is sufficient for a quart of coffee. By means of it the beverage is said to be of equal strength with a much less consumption of coffee. It is sold in tin boxes, on which the name and address of the manufacturer are stamped.—*Pharm. Journ.*

HISTORY, ANALYSIS, AND PRESERVATION OF ERGOT OF RYE.

By Victor Legrip.

Ergot of rye, which has been employed for nearly a century in medicine, has been the subject of opinions frequently opposed to one another. The effects which, at first, were most generally attributed to it induced the authorities to prohibit its use. At the commencement of the nineteenth century, Dr. Stearns, of New York, again extolled it, regulated its employment, and finally assigned to it a rank amongst the most powerful medicinal agents. Since then, Drs. Bellardini and Quill, MM. Roux, Harvez, Baudilocque, Chevreul, and Villeneuve, have so well established the obstetrical property of ergot of rye, that, notwithstanding a host of contradictory authorities, that of M. Capuron and many others, this substance is almost generally employed, however easy an accouchement may be. Does it always produce the desired effect? This our position does not enable us to establish; we would first ask, how many accouchements per cent. might have been made *sine pulvere ad partem!* A judicious reply might much diminish the reputation of this product.

It does not belong to us to set at nought the employment of a pharmaceutical drug; but we should prefer, however, that the property recognized in it should be established on the existence of a principle discovered by a chemical analysis, as is the case with quinquina, senna, and simaruba, &c. &c. Unless it be the same also with ergot of rye, its reputation is such that it will soon become a universal panacea. There is attributed to it a powerful action on the uterus embarrassed with the placenta, on the bladder in retention of urine, on the chest in dispnœa, on the stomach, &c.; it is recommended in paralysis, blennorrhagia, and blennorhœa, rebellious to all things known, and as a valuable hœmostatic against all sanguine emissions. At the same time that this substance is said to act energetically in the different morbid states we have just mentioned, it is considered to have no action on the healthy individual; it acts neither on the digestive organs nor on the encephalus, nor on the circulation; it has no action on the uterus before two months after conception. After these remarks, we ask if ergot of rye has no effect on healthy men? If M. Goupil has employed it without any symptom in the dose of one drachm? If Parmentier has also used it, and on himself, in this same dose for eight days, without being able to attribute to it any effect? If M. Muller is so far from sharing the fears of many physicians in the employment of ergot of rye, that he administers it in the enormous doses of from six to eight drachms? How are we to explain not only the gangrenous contagion which is imputed to it; but also the death with gangrene; also, in some individuals who have taken a few small doses of it, and finally, that with the same attack of different animals, birds and beasts, which, notwithstanding their repugnance, were made to eat it?

Before terminating this review of the various opinions of the ergot of rye—opinions which we do not intend to refute seriously—we will glance at the botanical descriptions of it which have been given. Some have regarded it as a species of itch, others as a morbid excrescence, without admitting that it was, as in the first opinion, the result of the sting of an insect. Some have regarded it as a monstrosity, others as an altered grain. The name of *Sclerotium clavus* would be more proper for designating it; but should we comprise, under this denomination, the entire ergot, or only some of its parts? There were, doubtless, few botanists who, with Mr. Smith, of the Linnæan Society of London, did not think that the fungus of ergot was even its envelope, and it appears that the microscopical observations of this *savant* have entirely confirmed his opinion.

M. Baudilocque, in a report on a memoir by M. Chevreul (D'Angers), in thinking that there should be a difference of action between the different parts of the ergot of rye, considered as an active part of its bark, if it may be so called, otherwise the fungus crust, which he called *Sphacelaria segitum;* he desired, in the name of the Commission, the employment, or at least the trial, of the isolated *Sphacelaria*. As it is doubtful that the crust of ergot of rye is ever employed alone in pharmacy, it appears to us more rational to designate by a suitable name the entire ergot, and not only one of its parts; therefore we continue, with M. Chevreul, to call it ergot of rye, and otherwise *semen fedatum secalis.*

The following is the analysis, which the desire of a just appreciation of the thing has made us undertake and follow, in the hope that it may be of some use to the practitioner:—

The ergot on which we operated was fresh; the powder was dried at O × 50. A hundred grammes of this powder were treated by cold sulphuric ether, by a new mode of accelerating displacement; the ethereal tincture was set aside under the denomination *a*.

The mass deprived of the ether, which it might retain by a sufficient exposure to a gentle heat, was treated with boiling alcohol at 36°. Exhausted by this menstruum, the alcoholic tincture was set aside under the designation *b*.

The mass dried *de novo*, was treated by boiling water, until perfectly exhausted. Half of the aqueous tincture was immediately evaporated by steam to the consistence of an extract, then set aside and ticketed *c*.

The other half was immediately tested with several reagents; we will make known the results in returning to this product under the designation *d*.

The mass exhausted by water, was completely dried and weighed as often as the former operations, in order to ascertain the diminution of weight; it then weighed 48 grammes.

Of these 48 grammes of residue, 12 grammes were treated with heat by a solution of ammonia, and designated *e*. Another portion likewise of 12 grammes, was boiled with water, acidulated by sulphuric acid, and the acid decoction produced was marked *f*.

Finally, the remaining 24 grammes of the residue were burnt in a close vessel. Here the gaseous products were neglected; those collected in the adapter and receiver weighed 16 grammes, viz: 1·75 ammoniacal salt, 5·9 empyreumatic oil, 9·25 tarry water and acetic acid. There remained in the retort 7·25 of light, shining, and friable charcoal. This charcoal was incinerated; there remained after this operation 0·8 of ash; this was treated by boiling water. This aqueous solution was marked *g*. The residue of this solution was dissolved in hydrochloric acid; it was heated almost to desiccation, re-dissolved in water, and after filtration this solution was ticketed *h*.

Finally, that which resisted the action of hydrochloric acid was submitted to that of nitro-hydrochloric acid; it was evaporated almost to dryness, then treated with distilled water; it was then filtered, and this solution in nitro-hydrochloric acid; was marked *i*.

We had also a residue from this operation of the weight of 0·075 gr. In order to terminate here our preliminary operation we regarded it as silica.

The ethereal tincture *a* was distilled as slowly as possible; there remained in the retort 34·5 gr. of fixed oil. This oil was of a fine yellow; it became thick by cooling; it was perfectly fluid and limpid only at O × 25, a temperature at which ether will separate from it. By filtration, at this same temperature, we separated from it a small quantity of black matter, of arsinous aspect, and almost tasteless. This oil has a very powerful odour, somewhat resembling sperm oil, and not the disagreeable odour of ergot of rye; it is less disagreeable to the taste than that of *Madia Sativa;** it contains—olein 73, stearine 27.

The alcoholic tincture *h*, of a deep colour, formed a turbidness in water; the greatest part of the alcohol was distilled over, in a sand bath; there did not pass over with it any principle capable of being isolated, although it had a little odour. That which remained in the retort was turbid, and of a deep brown, and was evaporated over water which was not boiling. This deliquescent extract, of a powerful and disagreeable odour, appeared to us, more than any other product, to contain the active part of ergot of rye; it dissolved only partially in cold water, which, by evaporation, gave a gummy saccharine extract, containing a little animal matter (osmazome.) The insoluble portion was entirely re-dissolved in hot water. On cooling, a slight turbidness was produced, then a light whitish precipitate; this was inulin. Filtered, the greatest part of the alcohol was removed by slow distillation; to the remaining part, which began to become turbid, cold water was added: a large quantity of very brown resin was precipitated; notwithstanding numerous washings, it could not be obtained less coloured. The aqueous extract *e*, of the weight of 11 grammes, re-dissolved in hot water, deposited inulin by cooling; alcohol precipitated from it much gum; iodine indicated the presence of amidin. Having, after filtration, distilled over alcohol, the remainder was brought to the state of extract; the latter on burning coals, gave out at once the odour of animal matter and that o burnt bread.

The aqueous tincture *d*. Remembering that M. Boujeau attributes to the aqueous extract of ergot of rye an eminently hœmostatic property, we thought that it must contain an astringent principle—tannin, for example; but we in vain tested for it by the solution of gelatine, and by a salt of iron. On the other hand, neither ferrocyanuret of potassium nor tincture of galls caused any precipitate. This aqueous tincture was co-

* Oil of *Madia Sativa*, when well prepared, is not disagreeable to the taste.—A.C.

loured blue by iodine; lime, potassa, and ammonia gave rise to a light and flocculent precipitate, which, on burning coals, produced an odour of burnt bread; subacctate of lead produced an abundant precipitate. This precipitate, treated by dilute sulphuric acid, abandoned fungic acid, which we combined with ammonia, for greater certainty; and from the portion of tincture on which we had poured the salt of lead, the excess of lead was removed by a current of sulphuretted hydrogen, and the excess of the latter was expelled by sustained boiling. Then this liquor was submitted to the following tests:—Nitrate of silver, an abundant, white, coagulated precipitate, insoluble in nitric acid; hydro-sulphate of ammonia, fawn coloured turbidness, due to fungin; oxalate of ammonia, a dull white precipitate; ammoniacal sulphate of copper, a precipitate of oxide of copper, produced by an alkali contained in the liquor, for a portion of the concentrated liquid gave with chloride of platinum an abundant yellow precipitate. Thus, the potassa constituted in it, with the fungic acid, fungate of potassa; lime gave a light precipitate in it; the salts of baryta did not indicate the presence of sulphuric acid.—*Chemist.*

(To be concluded.)

ON THE JAMAICA DOGWOOD.

By William Hamilton, M.B., H.M.L.S.
(Of Plymouth).

Having been informed by my friend Charles Balkwill, of this town, that communications, relating to the medicinal and pharmaceutical properties of the West Indian productions, would be acceptable to your journal, I avail myself of the intimation to communicate to you a few facts which fell under my own observation, during a residence of some years in the Antilles.

I first arrived in those islands in the month of March, and having in the following month of April, been invited to a fish-poisoning party, at a little bay, of the island in which I resided, my attention was forcibly attracted by the powerful narcotic effects exhibited by the bark of the roots of the *Piscidia erythrina*, or Jamaica dogwood, upon even the larger kinds of fish; and it occurred to me, that advantage might be taken of this property to render it subservient to the purposes of medicine.

I accordingly procured a quantity of the bark, and after various trials found that the tincture, prepared by macerating the bark of the roots gathered during the period of inflorescence, and before the appearance of the leaves (the piscidia being one of the few deciduous trees indigenous within the tropics) in four times its weight by measure of rectified spirit for twenty-four hours, and filtering, was the only preparation available for medicine. The tincture so prepared appeared to be fully saturated, and was of the colour and transparency of fine maderia or sherry.

Having been for some time a martyr to the toothache, which had deprived me of my natural rest, I determined to make the first trial of my new medicine upon myself; and accordingly, on going to bed, mixed a drachm-measure of the tincture with a rummer of cold water, and drank it off—waiting to observe its effects. Soon after receiving it into the stomach, I experienced a violent sensation of heat, which gradually increased in intensity, awakening in my mind a suspicion that the predictions of my friends, who assured me I should poison myself, were on the eve of fulfilment. However, the deed was done and I resolved to abide the issue without flinching. The sensation of burning gradually extended itself to the surface, and while I was considering what antidote I ought to employ, a profuse diaphoresis burst out from every pore, and a sleep the most profound I ever experienced, arrested me so abruptly, that I remained motionless for the whole night, with the uncorked vial in one hand and the glass out of which I had taken the dose in the other, till after the sun was high above the horizon on the following morning, a space of twelve good hours, when I first returned to consciousness, free from every pain or ache, and without any of those unpleasant sensations which invariably succeed to an overdose of opium.

I had certainly taken a larger dose than was, perhaps, necessary; but the result was most triumphant. I afterwards employed it with equal success, as a topical application, in a number of cases of carious teeth, introducing it on a dossil of cotton into the diseased cavity; and after a single application, I never heard of a return of pain in that tooth. Wishing to compare its powers with those of opium, I took equal measures of water, containing the animalculæ of the mosquito, and and having dropped into one glass as much of the tincture of opium as was necessary to make them fall motionless to the bottom, I added an equal number of drops of the dogwood tincture to the other, with a corresponding effect. I then decanted the supernatant liquor, and washed the mass of animalculæ in each glass with fresh filtered water from the dripstone; after a few ablutions, those which had been stupified by the tincture of opium recovered, and swam about with their wonted vivacity, while all my efforts to revive those acted upon by the dogwood proved ineffectual.

Circumstances which it would be impertinent to detail, prevented my following up these experiments to a more satisfactory conclusion; but the subject will yet, I trust be taken up *con amore* by some competent observer. I shall therefore conclude for the present with a few cautions which appear to me essential to success: First, the bark of the root should be collected about the period of the full moon in April, at which time the tree is in full flower, or coming into flower, and the leaves have not yet unfolded. Next, that the best rectified spirit alone should be used in making the tincture—the active principle of the bark being only soluble in spirit, and precipitating on the addition of water, with which it makes a milky compound. It is possible that a longer maceration than I employed might be successful in extracting more completely the active principle; but it might be desirable to divide the tincture so obtained, keeping that made during the first twenty-four hours distinct from the second, or making a portion with twenty-four hours' maceration, and another portion with forty-eight hours' or more; and comparing, by some common test, the relative qualities of each. The following is the formula for the tincture I used.:—

℞ Pulveris crassi corticis radicis piscidiæ erythrinæ, ℥ j.
Spiritus vini rectificati, fl ℥ iv.

Macera simul per horas viginti et quatuor in vasi aperto et cola. Dosis fl ℥ j. et infra ex haustu aquæ puræ.

The bark, on being chewed, gives out an unpleasant acrimony, similar to that of the mezereon; but the tincture, probably from being largely diluted with water, did not appear to me to excite the same sensation in the throat and fauces. Since my return to England, I have had a bottle of the tincture, prepared at my request for me by Menzies and Co., of Kingston, Jamaica, and sent to me by Dr. Bancroft. But upon trial, I found its effects very different from those which I recollect to have experienced from the tincture prepared by myself, at the season and with the precautions I have mentioned. Hence it is clear that these precautions should not be neglected.

Should this brief notice be favourably received, it may, perhaps, be followed by further communications on the medical properties of the West Indian Flora at future periods.—*Pharm. Journ.*

14, Octagon, Plymouth,
June 24, 1844.

CHEMICAL SOCIETY OF LONDON.

April 15, 1844.

W. T. Brande, Esq., Vice-President, in the Chair.

The following communication was read:—

"An improved Method for the Detection and Quantitative Determination of Arsenic in Cases of Poisoning." By Drs. Fresenius and von Babo.

The authors, after detailing the objections to the means at present adopted for detecting arsenic, as that of Reinsch, Marsh, and the various modifications which have been proposed of this latter method, give the process which forms the subject of this communication. Part of the material to be tested is treated with hydrochlorie acid, and chlorate of potash added, assisted by heat, and when sufficiently acted upon, filtered, and the solution concentrated; solution of sulphurous acid is next added in excess, and this excess afterwards expelled by heat. Sulphuretted hydrogen is then passed through the solution to saturation, ammonia added, and the whole lightly covered and kept warm until the odour of the gas has disappeared. The precipitate is collected on a filter, and is next acted upon by fuming nitric acid, added by degrees until the whole is moistened, and is then reduced to dryness in the water bath. It is next moistened with hydrated sulphuric acid, and heated in a water bath for two or three hours, and finally to about 302°, Fahr. The dried and charred residue thus obtained is treated with from ten to twenty parts of distilled water, hydrochloric acid added, and again precipitated as sulphuret, collected, and ammonia added, and the ammoniacal solution evaporated to dryness, and dried at 212°; the charred residue, and anything that remains undissolved by the ammonia, must be tested for lead, mercury, bismuth, copper, &c. The reduction of the resulting sulphuret of arsenic is then fully described, and the apparatus into which it is to be conducted figured. The process consists in mixing the sulphuret with dry carbonate of soda and cyanide of potassium, and introducing it into the reduction-tube, dry carbonic acid being passed over it, while it is gently warmed, so as to expel all moisture; the flame of a spirit-lamp is applied to the tube beyond the materials, for the purpose of decomposing the liberated vapours, and another strong flame is gradually applied to the mixture until all arsenic is expelled. The reduced arsenic forms a film in advance of the first spirit-lamp flame; should zinc or antimony be present, they will be obtained in their metallic state by dissolving in water the residue found in the reduction-tube.

ON THE MODE OF PRESERVING COLCHICUM CORMI.

By Joseph Houlton, M.D.

[Addressed to the Editor.]

In the last July number of your valuable journal, you honoured me by a notice of a paper of mine, on the drying of roots, &c., which had been read before the Royal Medico-Botanical Society; I therefore take the liberty to offer some further remarks on the subject—remarks which have been stated to the above-named society, but I am not aware that they have been made public. It always affords me much pleasure to contribute the humble results of my observation and experience towards the advancement of a department of science that has been till lately too much neglected; I am happy to see a spirit rising amongst the pharmaceutical chemists of our country for the improvement of pharmacy. England bids fair to be soon foremost in the field of this department, from the talent and industry that is now engaged in the work. It is curious to contemplate the position that pharmaceutical power is likely to hold in a few years' time, and also its influence, not only on science, but on institutions.

The observations which I beg to place before you are upon the method in which the cormi of colchicum should be managed, so as to ensure their drying spontaneously without being sliced. It is simply this: they are to be stripped of their loose dry coats, and the bud or little bulb, the rudiments of the future plant, is to be carefully picked out—it is a very small part, but easily seen; this part has a high vital endowment, and is very tenacious of life, and unless removed the cormi will not readily become dry; yet when that is removed, in any dry place, they will become exsiccated without any trouble, and that in a short time. To shew the difference that this circumstance makes, let a few be placed in their entire state near those that have been mutilated, and the difference in a week or two will be very manifest, the entire cormi will appear quite fresh. The plan I adopt is more safe and economical than that usually followed, as the cormi are not

exposed to a high temperature, nor are their juices under the direct influence of the atmosphere, both of which circumstances are injurious to the more delicate medicinal vegetable articles.

I have chosen this season of the year to make this communication, because the time is near when the cormi colchici will be ripe: they should be dried before the bud has sprouted. August is a very proper time for preparing them. I hope some, at least, of the pharmaceutical chemists will try the method, if it be but on a small scale. I cannot at present recommend it to be generally adopted, as it is contrary to the explicit orders of the College, and those who have the temerity to break the laws therein laid down, know very well that "*they will not only incur Her Majesty's displeasure, but be proceeded against for such their contempt and offence according to the utmost severity of the law.*"

But practitioners may follow the laws of nature and the dictates of their conscience in reference to pharmacy, without the fear of penal statutes, and I hope there are many who do, and that they will aid in carrying out improvements in Materia Medica, Pharmacy, and Therapeutics.—*Pharmaceutical Journal.*

MEMORANDA FOR DRUGGISTS.

Black Powder of Platina.—Muriate of platina. Expose it to heat, until it becomes a greenish-yellow chloride, then dissolve it in a strong solution of potass in a large vessel, and add alcohol (cautiously) to precipitate the platina. Collect the black powder and boil it in alcohol, filter, and repeat the boiling and filtering, first with muriatic acid, then with a solution of potass, and lastly with four or five times its weight of water, then wash it with pure water, and dry it on a porcelain capsule.

Imitation of Platina.—Pale brass, eight parts; spelter, five parts.—Mix.

Pommade de la Jeunesse.—Lard, sixteen ounces; white wax, one ounce; dinitrate of bismuth, or pearl white, two ounces. Scent to taste. Used as a pommade to dye the hair black.

Pommade Divine.—Lard, three pounds; white wax, half a pound; balm of Gilead, three ounces; oil of cloves, six drachms; essence of bergamotte, four drachms. Mix well.

British Port.—Damson juice, twenty gallons; cider, twenty gallons; sloe juice, one gallon; sugar, ten pounds; honey, ten pounds. Ferment, then add, spirit, three gallons; red cape, ten gallons; red tartar (dissolved), three-quarters of a pound; powder of catechu, three-quarters of a pound; bruised ginger, one ounce; cassia, one ounce; cloves, half an ounce. Mix well with one pint of brandy colouring, and fine with bullock's blood.

Pure Potass Water.—Powdered fresh burnt lime, one part; solution of pearlash (filtered), two parts; hot water, ten parts. Mix and agitate well in a close vessel; when cold, filter, and reduce it to any required strength.

Pradier's Cataplasm.—Pradier's remedy for the gout was purchased by the Emperor Napoleon, *pro bono publico*, for £2500:—Take of balm of Mecca, six drachms; red bark, one ounce; saffron, half an ounce; sarsaparilla, one ounce; sage, one ounce; rectified spirit of wine, three pounds. Dissolve separately the balm of Mecca in one-third of the spirit of wine; macerate the rest of the substances in the remainder for forty-eight hours, filter, and mix the two liquors for use; the tincture obtained is mixed with twice or thrice the quantity of lime water; the bottle must be shaken, in order to mix the precipitate settled at the bottom by standing.

Mode of Application.—The following is the mode of employing the remedy:—A poultice must be prepared of linseed meal, which must be of good consistency, and spread very hot, of the thickness of a finger, on a napkin, so as to be able completely to surround the part affected; if it be required for both legs, from the feet to the knees, it will take about three quarts of linseed meal. When the poultice is prepared, as hot as the patient can bear it, about two ounces of the prepared liquor must be poured equally over the whole of the surface of each, without its being imbibed; the part affected is then to be wrapped up in it, and bound up with flannel and bandages to preserve the heat. The poultice is generally changed every twenty-four hours, sometimes at the end of twelve.

Prepared Chalk.—A solution of muriate of lime, and add a solution of carbonate of soda as long as it causes precipitation; wash the sediment and dry it.

Abernethy's Preventive Lotion.—Bichloride of mercury, twenty-five parts; milk of almonds, four hundred parts; alcohol, one hundred parts; rose water, one thousand parts. Immerse the glands in a little of the mixture, and be particular to open the orifice of the urethra, so as to admit the contact of the fluid.

To Dye with Prussian Blue.—Immerse the silk (previously properly cleaned with soap) in a bath of persulphate of iron, then rinse well in clean water, and plunge it into a bath of ferrocyanide of potash, slightly acidulated with sulphuric acid.—Rinse. Every shade of blue may be dyed in this way by properly apportioning the strength of the baths, and the duration of the immersion.

POETRY AND PHARMACY.

Some few months back, I was travelling (says a correspondent of the "Chemist") through a town situate a short distance north of London, and had occasion to go into a shop wherein was displayed, just in front of the door-way, and about four feet within the shop, the diploma of the Pharmaceutical Society, handsomely framed, glazed, and elevated on a stand, enough to convince the "uninitiated" that they stood in the presence of a "Royal Arch" chemist whenever they stood before the head of that emporium. From this establishment I obtained the following poem:—

"If drugs you would have of the very best sort,
Go to ——'s, the Chemist, where they may be bought,
And fine patent medicines for woman or man,
Horse, cattle, and pig drinks the best that you can;
Genuine sheep ointment the strongest that's made,
In preparing of which ——— can challenge the trade.
If tea you would have of the finest in kind,
The price and the palate he'll suit to your mind:
He's fine Turkey coffee the best in the mart,
To warm both the stomach and gladden the heart:
If wines are your object, both strong, good, and old,
His is the shop where the purest are sold:
They'll cheer up the spirits and be a reliever
From cholera morbus or typhus fever.
His segars and snuffs are the rarest indeed,
And as for tobacco the pure foreign weed.
If spices, vinegar, or pickles you'd buy,
Just step into ———'s, have a little and try
Figs, oranges, lemons, or sugar candy,
Barley sugar, and most sweetmeats that are handy,
Lozenges, nuts, muscatels, almonds and prunes,
Fifes, flutes, and violins for playing your tunes.
If such you may want the best you can get,
As none are sold better in ———shire yet.
The young and the old may be suited to taste,
With fish-sauces, capers, or anchovy paste;
Also tooth, clothes, nail, plate, hair brushes, and oil,
Perfumery, hair pins, and combs free from soil.
Jewellery cheaper by twenty per cent.
Than many could buy if to London they went.
Stationery in all its various branches,
Engraving performed as fashion advances.
A large stock of snuff-boxes, rich, good, and rare,
And Rowlands' Macassar for oiling the hair.
Fancy soaps of all sorts for beauty and smell,
Cold cream for the hands and face—lip salve as well.
His paints, oils, and colours the richest in shade.
And as to quality the best that are made.
Ready money, remember, kills flying, they cry,
The which you must pay for whatever you buy."

Preservation of Pathological Specimens.—M. Pigné announces that a solution of creosote, in the proportion of 4, 5, 6, 8, or 10 drops, according to circumstances, to the litre, or pint and three quarters of water, forms an excellent, and of course very cheap, liquor for the preservation of specimens. An entire subject, or any portion of it, kept in the solution of 10 drops, preserves all its physical characters and properties unchanged for an indefinite length of time. Pathological specimens, that have been shrunk and blanched by twenty years' keeping in spirits, are speedily restored to their original form, size, and pliability, by being transferred to the creosote liquor. Portions of blood, pus, urine, &c., may be kept in it without undergoing any change, and examined at leisure. —*Medical Gazette.*

ON THE BEHAVIOUR OF THE DIFFERENT KINDS OF SUGARS TOWARDS CERTAIN REAGENTS.

By M. Baumann.

The sugars examined by the author were cane-sugar, diabetic sugar, milk-sugar, and mucic-sugar extracted from honey by alcohol. Nitric acid, protoxide of mercury and chloride of platinum had no action on any of them; ammonia, however, threw down a bright red precipitate from the solutions to which chloride of platinum had been added; nitrate of silver was considerably reduced by the last three kinds, but only very slightly by cane-sugar; sulphate of copper, acetate and chloride of copper had their blue colour changed into green by mucic-sugar; ammonio-sulphate, ammonio-acetate and ammonio-chloride of copper were converted into a bright brown colour by the same sugar; all these copper compounds are not affected by the other sugars.

The following combinations of copper afforded characteristic reactions at 212°:—

Sulphate of copper and excess of caustic potash:—with cane-sugar, no reaction; with diabetic sugar, a dirty yellow, slightly orange precipitate (some of the oxide was reduced to the state of protoxide); with milk-sugar, an orange-yellow coloured precipitate, which in forty-eight hours was converted into a tile-red one (the liquid remained clear); with mucic-sugar, a dirty yellowish-red precipitate.

Acetate of copper and excess of caustic potash:—with cane sugar, a slight red precipitate of protoxide of copper, the liquid clear and colourless; with diabetic sugar, at first a bright orange-coloured precipitate, which after eighteen hours becomes yellow; with milk-sugar, an orange-coloured precipitate, which soon becomes darker and at last brown; with mucic sugar, an orange-coloured precipitate, which soon becomes reddish-brown, from reduced protoxide of copper.

Perchloride of copper and excess of potash:—with cane-sugar, a yellow precipitate, of the colour of sulphuret of arsenic, unchanged after eighteen hours; with diabetic sugar, a dark yellow precipitate, slightly orange, after eighteen hours a dirty yellow; with milk-sugar an orange-coloured precipitate, becoming quickly brown; with mucic-sugar, a dirty orange-yellow precipitate, soon becoming reddish brown, from reduced protoxide of copper.

Protocyanide of copper and cyanide of potassium with excess of potash (prepared by precipitating sulphate of copper with prussiate of potash, addition of an excess of caustic potash, and filtration from the precipitated hydrate of the peroxide of iron):—with cane-sugar the clear colourless liquid acquired after some time a slight yellowish tint; with diabetic sugar, a light brown clear liquid; with milk sugar, a clear brown liquid; with mucic sugar, a reddish brown clear liquid.

Arsenic acid produces with all the sugars a red colour, which is darkest with cane-sugar, resembles raspberry juice with mucic-sugar, becoming gradually brown, and at last black. The cane-sugar, coloured brown by arsenic acid, no longer ferments. The brown solutions afford with sulphuretted hydrogen, yellow sulphuret of arsenic; with nitrate of silver, reddish-brown precipitates, which subsequently become black. Lime-water produces a brown precipitate; solution of sugar of lead, a dirty yellow; protonitrate of mercury and pernitrate, a white; salts of copper, a brown precipitate: all of them decolorising the liquid; nitrate of barytes, nitrate of lime, and perchloride of iron, do not cause any precipitate.

Gum and starch likewise afford with arsenic acid similar brown solutions. This is most distinct with inuline, from its not forming a paste. When the aqueous solution of inuline is heated for some length of time with arsenic acid, the inuline loses its property of separating on cooling, and on evaporation a rose-red mass is obtained, which gradually becomes black. The red colouring with arsenic acid is certainly peculiar to the fermentable sugars only; it has therefore the same power as other acids of affecting the conversion of gum, starch, and inuline into fermentable sugar.—*Archiv der Pharm.*, and *Chem. Gaz.*

ON POISONING WITH SULPHATE OF IRON.

By Dr. CHRISTISON.

[Read before the Medico Chirurgical Society of Edinburgh.]

The author commenced with observing that sulphate of iron, under its vernacular name of copperas, was long thought to be an active poison; that in recent times, however, it had been found in medical practice that considerable doses could be administered without injury; that experiments on animals by Gmelin tended to prove it to be nearly innocuous to the lower animals; but that the latest inquiries—those of Smith and Orfila—showed that it is an irritant poison of no small energy, if it be retained long enough in the stomach.

He then gave an account of a medico-legal case of recent occurrence, which, along with the physiological experiments instituted on the occasion of it, illustrates the accuracy of the view of the last-mentioned author, and proves that the sulphate of iron is a poison active enough to occasion death in the human subject. A child, four years of age, having died in circumstances which excited strong suspicions of poisoning, an investigation was made by the law authorities nearly four months afterwards. It appeared that the child, previously in good health, was attacked with violent vomiting and purging immediately after breakfast, and died in the course of the afternoon of the same day. The person suspected in the case was proved to have purchased both sulphate of copper and sulphate of iron not long before, and was seen by other children in the house to mix a blue liquid with the porridge, which the child took for breakfast, and also to give for drink, after the symptoms began, a liquid of a blue colour, made by dissolving a saline substance in water. Copper was naturally suspected. Mr. Dewar and Dr. James Dewar, of Dunfermline, who conducted the medical investigation, were naturally led to look for copper in the alimentary canal. There was none found, however, either by them or, subsequently, by Dr. Christison, who also analysed the contents and textures of the stomach. But there was obtained a large quantity of iron, partly in the soluble condition, but chiefly in the form of a compound insoluble in water. This appeared, in a great measure, to be sulphate of iron, formed by the decomposition of the sulphate through means of the sulphuretted hydrogen and ammonia disengaged during the decay of the body, for water, which had acted on the contents and textures of the alimentary canal, presented evidence of a much larger quantity of sulphuric acid than would have arisen from the ordinary contents; and the whole course of the mucous coat, from the mouth to the anus, was thickly lined with a layer of jet-black mucus. The tissues of the stomach presented everywhere the same colour. Iron was also found largely in numerous brown stains on the child's clothes, and on an apron worn by the person suspected to have administered the poison. The Messrs. Dewar made some experiments with sulphate of iron, from which they came to the conclusion arrived at by Orfila and Smith, viz.: that two drachms retained in the stomach by a ligature on the gullet will cause death in a few hours.

It appears, then, that sulphate of iron may cause death; that, if the body be buried for some months before being examined, the iron, as in the case of arsenic in similar circumstances, becomes united with sulphur, and that the colour of the contents and tissues of the stomach is thus changed to a deep black. The process employed for detecting the iron consisted in incinerating the contents and textures, acting on the residue with diluted nitric acid, aided by heat, adding an excess of ammonia, and transmitting sulphuretted hydrogen. The ammonia separates a yellowish precipitate of sesquioxide of iron, and does not render the liquid blue, if there be no copper. The sulphuretted hydrogen then produces black sulphuret of iron.—*Cormack's Journal* and *Chemist*.

DRUG PRICE LIST.

DRUGS.	PRICE. £ s. d.	£ s. d.	DUTY.
Alkanet Root, bd.. cwt.	0 12 6	to 1 0 0	1s. cwt.
Aloes, Barbadoes.....	5 0 0	13 0 0	per lb.
Epatica, bd.....	1 5 0	9 0 0	1d. BP.
Cape, bd.	1 0 0	1 12 0	2d. F.
Alum, British.....ton	10 0 0	12 0 0	
Roch.....cwt.	1 0 0	1 4 0	2s. cwt.
Ambergris, Grey...oz.	0 4 0	0 7 6	3d. oz.
Anchovies....dble. brl.	1 2 0	1 3 0	2d. lb.
Angelica Root..dpcwt.	1 0 0	1 15 0	4s. cwt.
Annatto, Flag, dp...lb.	0 0 0	0 0 8	1s. cwt.
Roll.....dp.	0 0 7	0 0 8	1s. cwt.
Antimony, Crude..cwt.	1 18 0	2 0 0	2s. cwt.
Ore, bd. .....ton	12 0 0	13 0 0	1s. ton
Regulus Cps. cwt.	2 15 0	3 7 0	4s. cwt.
Bowls	0 0 0	0 0 0	1s. B.P.
Arrow Root.....	0 0 5	0 1 4	B.P. 1s. F5s.cwt
Arsenic, White. ..cwt.	0 11 0	0 14 0	1s. cwt.
Red	2 7 0	2 10 0	6d. B.P.
English White	11 0 0	18 0 0	
Yellow.	32 0 0	38 0 0	
Argol, Bologna ....cwt.	2 12 0	2 16 0	
Florence White	0 0 0	0 0 0	
Red.....	2 5 0	2 7 0	
Naples White	2 0 0	2 3 0	6d. cwt.
Red.....	1 14 0	1 16 0	
Sicily White	1 12 0	1 18 0	
Red.....	0 0 0	0 0 0	
French	1 14 0	2 6 0	
Cape	1 18 0	2 14 0	
Boracic Acid.....cwt.	1 19 0	1 19 6	6d. cwt.
Balsam, Canada....lb.	0 1 0	0 1 2	1d. lb.
Capavi, bd....	0 1 0	0 1 6	4s. cwt.
Peru, bd.....	0 5 0	0 6 6	3d. lb.
Tolu, bd.....	0 1 6	0 1 9	2d.
Bark, Peruv. bd. p..lb.	0 0 6	0 0 10	
Good	0 2 3	0 2 9	
Mid do.....	0 1 3	0 1 9	
Crown.....	0 0 9	0 3 0	1s. cwt.
Yellow, Flat.....	0 3 8	0 3 10	
Quill	0 3 4	0 3 8	
Red, Flat	0 3 6	0 6 0	
Quill.....	0 1 6	0 2 0	
Cascarilla, bd.....cwt.	1 0 0	2 10 0	
Quercitron ....dp.	0 10 0	0 11 0	
Oak English.per ld	15 0 0	17 0 0	BP.id.c.
Forelgo .per ton	4 10 0	7 0 0	F. 3d.
New S. W.....	6 0 0	9 0 0	
Berries, Bay.....cwt.	1 5 0	1 6 0	
Junlper, Italian	0 5 9	0 6 0	
German	0 11 0	0 12 0	1s. cwt.
Turkey, Yellow .	1 15 0	2 0 0	
Persian, do. .	4 10 0	7 0 0	
Black Lead, E. I. .cwt.	0 6 6	0 8 0	
Malaga.	0 10 0	0 18 0	B.P. 5s.
German ..	0 9 3	0 18 0	ton
Dust	0 0 0	0 0 0	F. 20s.
Borax,or Tincal,bd.cwt.	2 6 0	2 12 0	6d. ton.
E. I. Refined, bd.	2 8 0	2 11 0	5s. cwt.
English Refined..	2 10 0	2 12 0	
Brimstone, Rgh. bd ton	5 5 0	5 10 0	BP.3d
Roll	8 10 0	9 10 0	F.6d.c. 1s. 6d.
Camphor, Unref. ..cwt.	6 0 0	6 5 0	
Dutch, bd... cwt.	0 0 0	0 0 0	1s. ct.
Refined.....lb.	0 2 0	0 2 2	10s.
Cantharides, bd.....	0 2 3	0 2 6	3d.
Capers, French ...cwt.	4 0 0	9 10 0	6d. lb.
Capotts	0 0 0	0 0 0	3d. BP.
Cardemoms, Mal. bd.lb	0 2 7	0 5 0	
Long Longs ..	0 4 6	0 4 9	2d.
Ceylon	0 1 2	0 1 8	
Castor, America....lb.	0 19 0	1 5 0	2s. cwt.
Castor Oil, America lb.	0 0 3	0 0 6	1s. 3d.
E. I. bd. ..	0 0 4	0 0 9	cwt.
Chillies, E. I. bd..cwt.	2 0 0	2 3 0	6d. lb.
China Root, bd....cwt.	1 5 0	1 10 0	3d. lb.
Cochineal, bd. Black lb.	0 4 9	0 6 0	
Silver...	0 4 8	0 5 2	1s. cwt.
Foxy.. .	0 4 5	0 4 7	
Cobalt, bd.....lb.	0 0 0	0 0 0	5s. ton.
Coculus Indicus, bd. c.	0 13 0	0 16 6	7s. 6d.
Colocynth,Turkey.dplb.	0 1 2	0 2 6	1d.
Spanish	0 1 4	0 1 9	
Colombo Root, bd.cwt.	0 8 0	0 18 0	1s.
Copperas Gr, bd ..ton	3 10 0	4 0 0	£1 ton.

DRUGS.	PRICE. £ s. d.	£ s. d.	DUTY.
Blue	1 17 0	to 2 0 0	10s. B.P.
Cream Tart. d.p. Fr. c.	3 0 0	3 5 0	1s. ct.
Venetian	2 18 0	3 4 6	
Cubebs, bd. .....cwt.	2 0 0	2 4 0	1d. lb.
Cutch	0 17 6	0 19 6	5s. ton.
Cowries	3 0 0	3 1 0	5 per cent.
Dragon's Blood, bd....	4 10 0	7 10 0	1s.
Reed.....	6 10 0	12 0 0	
Emery Stone.....	12 0 0	12 10 0	
Essential Oils,			
Cloves, bd.....lb.	0 7 0	0 10 0	4s. lb.
Carraway, dp.	0 8 9	0 9 0	
Lavender.....	0 7 0	0 0 0	2s. lb.
Peppermint,bd....	0 11 0	0 12 0	
Spike	0 4 0	0 0 0	
Annisced, bd. ..lb.	0 6 0	0 6 6	
Cassia, bd.....	1 4 0	1 5 0	
Cajaputa, bd. ..oz.	0 0 4	0 0 6	
Cinnamon, bd....	0 2 10	0 4 9	
Mace (expd.) bd..	0 0 8	0 0 10	
Nutmegs, bd.....	0 0 6	0 0 10	1s. lb.
Bergamot, dp...lb.	0 12 0	0 0 0	
Lemon	0 7 3	0 6 9	
Orange	0 4 6	0 5 6	
Rosemary	0 1 8	0 2 6	
Thyme	0 2 9	0 3 0	
Otto Roses ....oz.	0 16 0	0 16 6	
Almonds	0 1 7	0 1 11	
Galangal Root, bdcwt.	0 11 6	0 18 0	2d. lb.
Galls, in sorts ....cwt.	2 0 0	2 2 0	
Green or White	1 15 0	2 0 0	1s.
Blue	2 15 0	3 0 0	
E. I. Blue, bd.	2 12 0	2 16 0	
Gentian Root, bd..cwt.	0 18 0	1 4 0	5s. ton.
Gluc, Best Town..cwt.	2 9 0	2 10 0	
Inferior	1 18 0	2 4 0	
Foreign	0 0 0	0 0 0	3s. cwt
Guinea Grains, bd.....	1 10 0	2 8 0	15s. cwt
Gums,			
Ammoniac, Lp. bd. ct.	2 0 0	4 10 0	
Drop....	3 5 0	9 0 0	
Arabic, E. I. bd.....	1 5 0	5 0 0	
Cape	0 10 0	0 16 0	
Turkey, fine ..	8 0 0	11 0 0	
2nds and 3rds	5 0 0	7 0 0	
Barbary, Brown, bd	3 10 0	3 15 0	
White.	0 0 0	0 0 0	
Gedda, bd.....	3 5 0	0 0 0	
Animi, washed, bd ..	4 10 0	9 10 0	
scraped.....	7 5 0	10 0 0	1s. cwt.
Copal.....lb.	0 0 10	0 0 2	
Assafœtida, bd..cwt.	1 10 0	5 0 0	
Benjamin, 3rds, bd..	8 0 0	14 10 6	
1st and 2nds....	15 0 0	46 0 0	
Gamboge, bd.....	21 0 0	26 0 0	
Galbanum.....	5 10 0	8 0 0	
Guiacum.....lb.	0 0 8	0 2 0	
Myrrh, E. I. bd.cwt.	4 0 0	16 0 0	
Turkey.....	0 0 0	0 0 0	
Mastic.....lb.	0 2 10	0 5 0	
Olibanum, bd. ..cwt.	1 0 0	2 8 0	
Sandrack, bd.....	3 15 0	4 10 0	
Senegal, garbled, bd.	5 0 0	5 5 0	
Tragacanth, Picked	14 0 0	15 0 0	
Sorts	4 0 0	6 0 0	
Seedlac.....cwt.	1 0 0	1 15 0	
Lac, Sticklac, Bengal	0 16 0	1 0 0	
Siam, &c..	1 14 6	2 5 0	
Shellac, Liver...cwt.	1 14 0	2 10 0	
DT.....	1 11 0	1 15 0	
Orange.....	2 5 0	3 8 6	
Block	1 10 0	1 16 0	
Hellebore Root ...cwt.	2 0 0	2 10 0	3s. cwt.
Honey, Fine.....	2 10 0	4 10 0	B.P. 5s. F. 10s.
Iceland Moss .....lb.	0 0 2	0 0 3	5s. ton.
India Rubber, solid ...	0 0 3	0 0 8	1s. cwt.
bottles..	0 0 8	0 1 0	
small...	0 1 6	0 1 9	
Indigo....bd. } floras	lb. 0 5 0	0 5 6	Indigo
Guatimand } sobres..	0 4 0	0 5 8	cwt. F. 5s.
Caracca .. } cortes ..	0 2 6	0 3 9	B.P. 1s.

DRUGS,	PRICE. £ s. d.	£ s. d.	DUTY.
Bengal fine blue.....	0 5 6	to 0 6 2	
Fine purple & violet	0 5 6	0 6 2	
Good ditto	0 4 8	0 5 2	
Midd ing.....	0 4 3	0 4 6	
Copper Fine	0 4 10	0 5 2	
good and middling	0 4 0	0 4 9	Indigo
Ordin. violet & copper.	0 2 8	0 3 10	cwt.F. 5s.
Oude, good and fine...	0 3 3	0 3 9	B.P. 1s.
low and middling	0 2 6	0 3 3	
Madras, good and fine	0 3 9	0 4 11	
violet and blue			
ord. and mid. do.	9 2 6	0 3 8	
Java.....	none		
Manilla good and fine..	0 0 0	0 0 0	
ordinary and mid.	0 0 6	0 2 8	
Ipecacuanha, bd....lb.	0 1 9	0 2 0	1s. cwt.
Isinglass Leaf, 1st sort	0 10 0	0 12 0	5s. B.P. cwt.
2nd sort	0 9 0	0 10 0	£2 7s. 6d. F.
Simovia	0 2 6	0 3 0	
Siberia Purse ...	0 5 0	0 6 0	
Short Staple, 1st	0 8 0	0 11 6	
Long ditto.....	0 10 0	0 11 6	
Isinglass, Brazil	0 1 0	0 5 2	
Jalap, bd.....lb.	0 2 0	0 2 0	1d. lb.
Juice of Lemon....gal.	0 0 0	0 0 0	½d. gal.
Lac Dye Fine, bd. ..lb.	0 2 2	0 2 9	
Good	0 1 6	0 2 0	
Midding	0 0 10	0 1 4	1s. cwt.
Ordinary	0 0 4	0 0 9	
Lake.....	0 0 0	0 0 0	
Liquorice, Ital. d.p.cwt.	5 5 0	5 10 0	27s. 6d. c.
Block	3 5 0	0 0 0	£1 cwt.
Madders			
Dutch Crop..dp. cwt.	3 10 0	4 0 0	
Ombro.....	3 0 0	3 8 0	
Gamene	2 10 0	2 15 0	6d. cwt.
Mull.....	0 15 0	1 15 0	
French	3 2 0	4 8 0	
Spanish	1 5 0	1 18 0	
Madder Roots, Turkey.	3 15 0	3 16 0	3d. cwt.
Munjeet, E.I. bd...cwt.	0 0 0	0 0 0	
Magnesia, English....	3 0 0	3 5 0	
Manna, Flakey, bd..lb.	0 1 2	0 3 6	1d. lb.
Sicily, bd.	0 0 6	0 0 8	
Musk, good & fine, oz.	0 15 0	1 7 3	d. oz.
Nux Vomicæ, bd..cwt.	0 10 0	0 12 0	5s. cwt.
Olives, F.hf.-bris 12 gls	3 0 0	4 0 0	2s. gall
Spanish..keg 2 gls	0 9 0	0 10 0	
Opium, Turkey, bd..lb.	0 8 6	0 9 6	1s. lb.
Egyptian	0 0 0	0 0 0	
Orchella, Can.....ton	38 0 0	40 0 0	
Cape de Verd ..	35 0 0	55 0 0	1s. cwt.
Madeira.....	0 0 0	0 0 0	
Orpiment, E. India, bd	0 0 0	0 0 0	1s.
Orange Flower Water .	0 0 8	0 0 0	1s.
Peel .....cwt.	1 16 0	0 0 0	1s.
Orris Root, d. p. ..cwt.	1 0 0	2 15 0	5s.
Pelitory Root.....lb.	0 1 0	0 0 0	1s. cwt.
Pink, Root..... lb.	0 0 7	0 1 0	1s. lb.
Pitch, Burgundy..cwt.	0 10 0	0 0 0	2s. cwt.
Pumice Stone,sorts ton	5 0 0	6 0 0	
Quassia .....cwt.	0 15 0	0 0 0	10s. cwt.
Quicksilver .....lb.	0 4 6	0 0 0	1d. lb.
Rhatania Root .....lb.	0 0 4	0 0 6	
Rhubarb, round, bd. lb.	0 1 0	0 3 8	
flat	0 1 6	0 3 9	3d. lb.
Dutch, trimd	0 4 6	0 6 0	
Russia	0 8 0	0 11 9	
Saccharum Saturne, lb.	2 6 0	2 10 0	10s. cwt.
Saffron, Spanish ....lb.	1 15 0	2 5 0	1s. lb.
Sago, common, bd. cwt.	0 11 6	0 12 0	
Pearl	0 13 0	1 3 0	1s. cwt.
Sago Flour.....	0 18 0	1 0 0	
Sal Amm. E.I. bd. cwt.	2 6 0	2 10 0	1s. cwt.
English, Refined cwt.	2 2 0	2 3 0	
Salts, Glauber	0 6 6	0 0 0	
Epsom	0 9 6	0 10 6	
Salep .....cwt.	5 5 0	5 10 0	

DRUGS,	PRICE. £ s. d.	£ s. d.	DUTY.
Sarsaparilla, Bra. bd.lb.	0 0 10	to 0 1 8	
Honduras bd. ..	0 1 0	0 1 10	1d. lb.
Vera Cruz, bd...	0 0 8	0 1 2	
Jamaica, bd.....	0 1 0	0 2 11	
Sassafras Root.... ton	7 0 0	8 0 0	6d. cwt.
Safflower, E.I. bd...cwt.	4 10 0	8 10 0	1s. ct.
Turkey	0 0 0	0 0 0	
Shumac, d.p. Mal..cwt.	0 0 0	0 0 0	
Sicily.....	0 10 0	0 11 0	1s. ton
Tricste	0 5 6	0 6 0	
Saltpetre, Rhg. bd.	1 3 6	1 7 6	
British Refined	1 9 6	1 10 0	6d. cwt.
Nitrate of Soda	0 14 0	0 15 0	
Scammony, Smyrna lb	0 9 0	0 10 0	
Aleppo, 2nds, bd..	0 8 0	0 14 0	6d. lb.
fine .. :..	0 15 9	1 1 0	
Seeds, Annis.....cwt.	0 0 0	0 0 0	
German, duty paid	1 5 0	1 15 0	BP 2s6d
E. I. Star, bd.....	2 7 6	3 0 0	F 5s. c
Cummin, bd...cwt.	0 19 0	1 5 0	
Carraway, For. bd.	1 6 0	2 14 6	BP5sF10s
Seneka Root, bd. .. lb.	0 1 8	0 1 9	
Senna, Alexandria.. lb.	0 0 9	0 1 0	
Smyrna	0 0 0	0 0 0	1d. lb.
East India, bd.	0 0 5	0 0 8	
Tinnevelly...	0 1 8	0 1 9	
Smalts, Saxon, FFFE lb.	0 0 0	0 0 0	
Danish, do. ..	0 1 6	0 1 7	2d. lb.
Other sorts in proportion.			
Snake Root, bd.... lb.	0 1 2	0 1 3	1s. lb.
Soap, Naples, soft	0 1 6	0 1 9	56s. cwt.
Castile, bard..cwt.	3 10 0	3 17 0	30s. cwt.
Soy, bd. .....gallon	0 5 0	0 7 6	20 pr. cent
Sponge, finc.....lb.	0 13 0	1 0 0	F 6d.lb.
ordinary.....	0 2 5	0 10 6	B 1d.
Sulphate of Quinine oz.	0 8 3	0 8 6	6d. oz.
Squills, dry .....lb.	0 0 2	0 0 3	1s. cwt.
undried	0 0 0	0 0 0	6d. cwt.
Spermaceti, English lb.	0 1 8	0 0 0	
American	0 1 4	0 1 6	25 cnt.
Tamarinds, W. I...cwt.	2 0 0	3 18 0	BP. 1d.
E. I. bd. ..	0 15 0	1 5 0	F 3d lb.
Tapioca, bd. ..... lb.	0 0 3	0 0 7	1s. cwt.]
Turmeric, bd. Ben.cwt.	0 13 0	0 14 0	
Java	0 8 0	0 16 6	F 5s ton
Java, green ..	0 10 0	0 11 0	BP. 1d.
China.....	0 18 0	1 1 0	
Terra Japonica, black	0 13 6	0 14 0	5s. ton.
De Sienna.....	1 4 0	0 0 0	10s. ton.
Valonia Smyrna .. ton	15 0 0	17 0 0	
Picked Morea.	18 0 0	21 0 0	5s ton
Vincltoes, Brazil, bd.lb.	0 10 0	0 11 0	
Vera Cruz ..	2 10 0	4 0 0	5s. lb.
Verdigrease, For. D. P.	0 0 9	0 1 3	
English..	0 1 3	0 0 0	1d. lb.
Vermillion, China, bd.lb.	0 4 2	0 5 3	
English....	0 5 6	0 5 10	3d. lb.
Vitriol, blue .....cwt.	1 15 0	1 18 0	
Foreign, white .	0 15 0	0 18 0	BP. 10s
English, do. ..	1 4 0	1 5 0	F 1s to n
Oil of..... lb.	0 0 1	0 0 0	
Wax Mogadore, bd.cwt	7 10 0	8 0 0	
American, d.p...	7 10 0	8 2 6	
Russian, d.p....	9 0 0	9 5 0	
Hambro' d.p...	8 10 0	9 0 0	
East India, d.p..	6 7 6	8 15 0	
African, d.p....	7 10 0	8 0 0	
White Hambro' .	9 15 0	10 10 0	
English ....cwt.	9 0 0	9 15 0	
Cape	7 10 0	9 0 0	
Weld, English ....load	0 0 0	0 0 0	5s. t
Woad .....ton	0 0 0	0 0 0	
Wood, Sapan Rimas, bd.11	5 0	16 0 0	
Siam	9 0 0	11 0 0	2s. ton

B.P. bleached 10s. un
do. unbl. 1s. F do.
2s F bl. £1 cwt.

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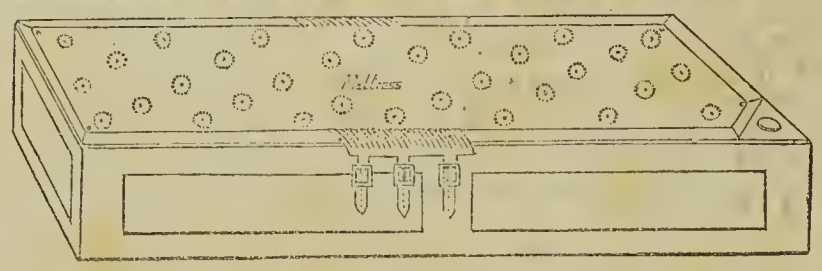

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